PIT AND QUARRY

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PERIODICAL DIVISION

OCTOBER, 1939

The Lubrication of Crushers . . . New York Trap Rock Company's New Quarry-Haulage System . . . Making and Merchandising Concrete Brick

ANOTHER MILLION-TONNER

that never required a single take-up!

HERE is a typical example of the low cost-per-ton, trouble-free service that results from having your elevator belts specified by the G.T.M.—Goodyear Technical Man.

On his recommendation the belt here pictured, a 12-ply Goodyear Style RC, was installed in the Bellevue, Ohio, plant of The France Stone Company early in 1931.

Equipped with 120 steel buckets having a capacity of 150 tons per hour, this belt performed for seven years *without requiring a single repair or take-up*—with an estimated tonnage of more than 1,000,000 tons to its credit at the time of its removal in 1938.

Under water two months!

But that isn't the whole story. During a flood it was under water for two months, yet when the water receded it showed no ill effects from its long immersion—striking proof of the value of Goodyear's exclusive mildew-inhibiting construction.

This is the kind of economical service the G. T. M. offers you on all elevator, conveyor and transmission belts—and hose, too. To bring him to your plant, write Goodyear, Akron, Ohio, or Los Angeles, California—or phone the nearest Goodyear Mechanical Goods Distributor.

THE GREATEST NAME IN RUBBER

GOODYEAR

Centennial of Charles Goodyear's discovery of vulcanization

Keeping Production Costs Down with LINK-BELT EQUIPMENT!

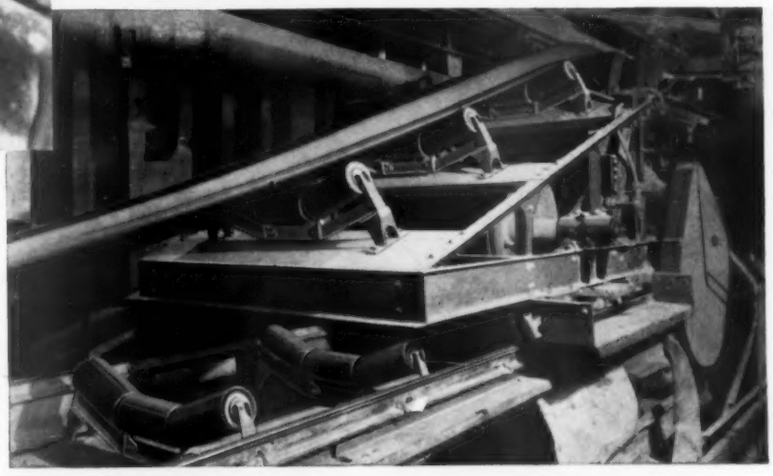
● For smooth, dependable low-cost materials handling, preparation and power transmission equipment—depend on LINK-BELT. We make everything for the complete system, including the driving machinery, and shall be pleased to engineer and furnish the complete installation, or, if preferred, simply supply the parts desired.

Link-Belt's broad experience in the art of handling materials from where they are to where they are wanted next, is at your service. No inquiry is too large or too small to merit our painstaking attention.

LINK-BELT COMPANY

Chicago Philadelphia Indianapolis Atlanta San Francisco Toronto
Offices in Principal Cities 7712-C

New York World's Fair Exhibitor—Metal Bldg.

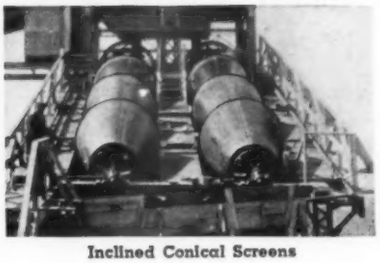


● Above: Controlling speed of feeder belt conveyor from mill storage bin to ball mill—with P. I. V. Gear infinitely variable speed transmission.

Right: 30″ wide anti-friction belt conveyor handling 400 tons of material per hour, working 16 hours per day, or at the rate of 6000 tons per day—half of this volume being a circulating load. The tripper is of all-steel construction, completely automatic, electrically controlled.

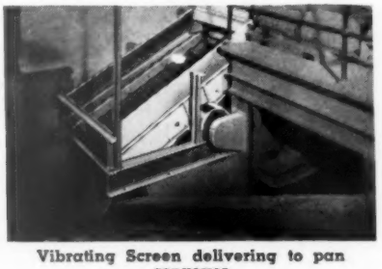
Self-Aligning Idler keeps conveyor belt central

Belt Conveyor with travelling feeder

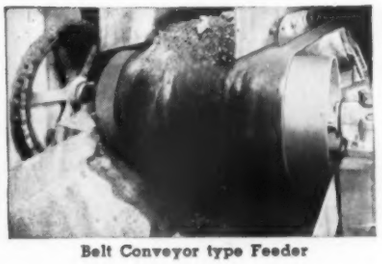


Inclined Conical Screens

Apron Conveyor delivering from bin to primary crusher



Vibrating Screen delivering to pan conveyor



Belt Conveyor type Feeder

LINK-BELT CONVEYORS

and elevators of all types ...Complete Sand, Gravel, and Stone Washing Plants...Screens (vibrating, rotary and conical) ...Washers and classifiers, of the screw, log, flight, Shaw and conical types...Dewatering Rotoscoops and Screw Conveyors ...Shovels-Draglines...Silent and Roller Chain Drives...Speed Reducers...Variable Speed Transmissions...Chains (Malleable Iron, PROMAL and Steel)...Sprockets...Buckets...Gears...Couplings...Self-aligning Ball and Roller Bearing and Babbitted Bearing Units...Clutches...etc. Catalogs on request.

THE SYMBOL OF QUALITY LB LINK-BELT

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The CRUSHER that can take it!

Two weeks collection of tramp iron which passed through a 7 foot Symons Short Head Cone Crusher . . . The largest piece measured 1½"x3"x14".

UNTIL THE ADVENT OF THE SYMONS CONE CRUSHER

tramp iron had long been a source of worry to those engaged in fine crushing. Here is what one operator had to say. "Shutdowns were frequent, costs were uncertain because of enforced delays due to excessive breakage. Plugged machines had to be freed continually with a torch to cut out frozen and wedged-in tramp iron. The Cone Crusher overcame these troubles, helped reduce and stabilize costs." The best evidence of this statement is the universal acceptance of the Cone as the outstanding crusher in its field.

While tramp iron is not recommended as a regular diet for a Cone Crusher, its construction is such that damage will not result should any ordinary non-crushable material get into the crushing cavity. The band of heavy coil springs encircling the frame allows the bowl to lift from its seat with each movement of the head until such non-crushable objects pass off into the discharge. The tramp iron shown in the accompanying illustrations passed the protective devices installed for its removal, and would have resulted in expensive repairs and long shutdown periods for any crusher except the Symons Cone.

NORDBERG MFG. CO. *Milwaukee, Wis.*

NEW YORK CITY
60 East 42nd Street

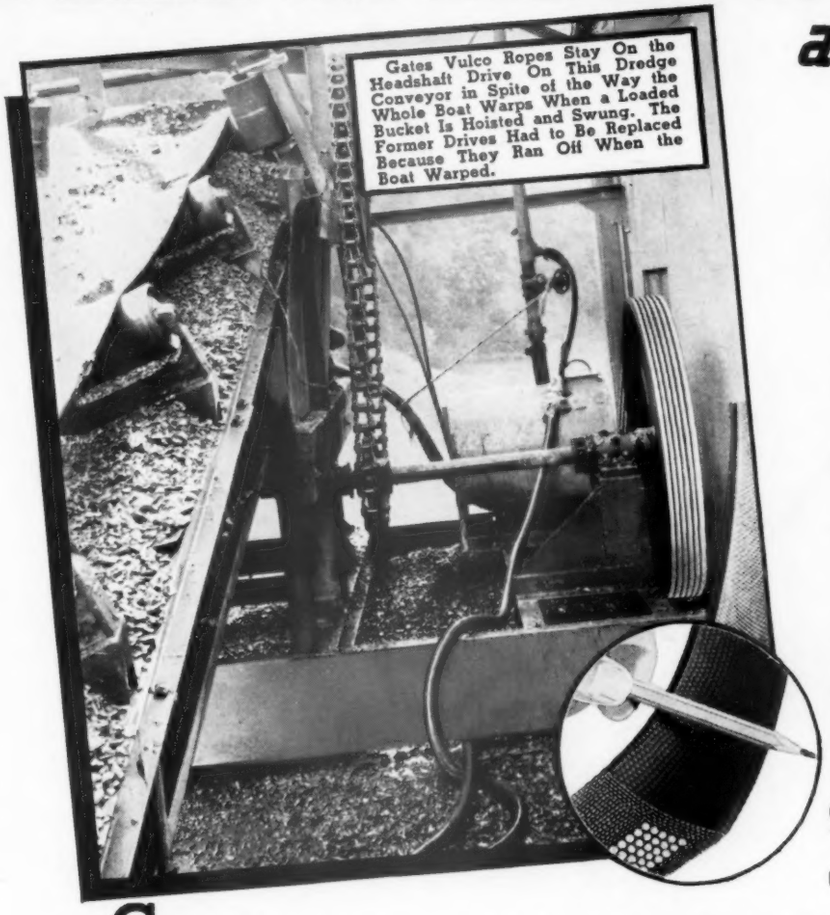
LOS ANGELES
Subway Term. Bldg.

TORONTO
Concourse Bldg.

LONDON
Bush House

SYMONS CONE CRUSHERS

FEEL the SIDES of a V-BELT *as it Bends!*



Gates Vulco Ropes Stay On the Headshaft Drive On This Dredge Conveyor in Spite of the Way the Whole Boat Warps When a Loaded Bucket Is Hoisted and Swung. The Former Drives Had to Be Replaced Because They Ran Off When the Boat Warped.

PROVE for YOURSELF *this SAVING in BELTS and POWER ! !*

THE **CONCAVE** SIDE IS A GATES PATENT

What Happens When a V-Belt Bends

FIG. 1

FIG. 2

GRIP with your fingers the sides of *ANY* V-Belt—then bend the belt as it would bend in going around a pulley. You will *feel* the sides of the belt *change shape!* If the sides were *straight* before bending, they become *convex* as the belt bends. (See Figure 1 on the right). Note the out-bulge of the sides.

Now look at Figure 2. This shows the *same* shape-change in a belt with the patented concave side. But what a different result! This belt, when bent, precisely fits the sheave-groove. Two big savings result—(1) There is no side-bulge and this means uniform side-wall wear—*longer life!* (2) There is a full side-width grip on the pulley and this carries heavier loads without slippage—saving the belts and also saving your *power!*

The Gates Vulco-Rope is the only V-Belt built with the patented concave side.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO, ILL., 1524 South Western Ave. HOBOKEN, N. J., Terminal Building BIRMINGHAM, ALA., 1631 1st Ave., S. LOS ANGELES, CAL., 741 Warehouse St.

DENVER, COLO., 999 South Broadway DALLAS, TEX., 2213 Griffin Street PORTLAND, ORE., 1231 N. W. Hoyt St. SAN FRANCISCO, CAL., 2700 16th St.

How G-E equipment helps KEEP THE COST

Notes on our trip to the plant

G-E 4000-kw a-c turbine, which supplies power for the plant. This turbine utilizes the waste heat from the kilns. It has given practically trouble-free service since it was installed, 12 years ago

G-E 100-hp, Type FTR, 1765-rpm induction motor, controlled by G-E CR7006 magnetic switch, driving coal pulverizer. This is one of six such equipments in the plant—one for each kiln

G-E 350-hp, 257-rpm synchronous motor driving a compressor in the cement plant

ELECTRICAL MAINTENANCE ONLY

The Hawkeye Portland Cement Company operates a rock-crusher plant at Earlham, Iowa, which has been in operation for nine years. This plant is equipped throughout with G-E motors and control. There are 17 motors in all, with a total of 632.5 horsepower. Maintenance on *all* the electric equipment has averaged less than $30 a year—about 4 3/4 cents a horsepower. The company reports only anticipated minor servicing, and no shut-downs as a result of failure of the electric equipment. This with standard, open motors and standard control that operate in dust-filled atmospheres, sometimes for as long as 16 hours a day!

GE

GENERAL

Hawkeye Portland Cement Co.
PER BARREL DOWN

THE Hawkeye Portland Cement Company produces high-grade cement at low cost in its six-kiln, G-E equipped throughout, wet-process plant at Des Moines, Iowa.

One reason is that the company has continued to keep its plant up-to-date. A year or two ago, for example, it installed coal pulverizers—each driven by a G-E 100-hp motor—for individual firing of the kilns. These pulverizers have markedly reduced coal-grinding costs and have practically eliminated coal wastage.

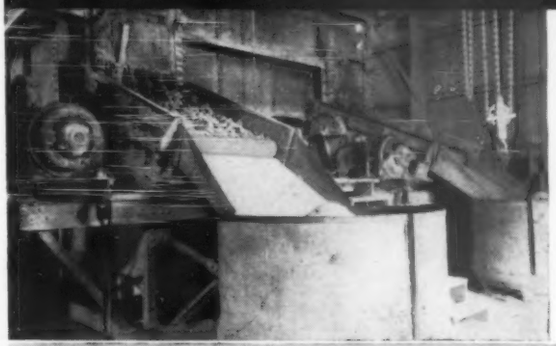
Another reason is the help that G-E engineers gave in revamping the plant's electrical system 12 years ago. This step proved to be of vital importance in enabling Hawkeye to meet modern production requirements.

These engineers showed the economies of changing from the d-c system then used to an a-c system and of replacing the old turbine-generator with a more efficient one that would give, at no increase in the capacity of the waste-heat boilers, the additional power needed to produce a higher-grade cement.

Hawkeye followed their recommendations. The plant has now been almost entirely changed over to a-c equipment, and the G-E 4000-kw turbine-generator, motors, control, and other G-E equipment have set a high standard for continuous operation and low maintenance.

This is another example of how many cement companies are benefitting from G-E engineering and equipment. Remember it when making your modernization plans. Our nearest representative will be glad to help you with the electrical requirements. General Electric, Schenectady, N. Y.

$30 A YEAR AT THE ROCK-CRUSHER PLANT

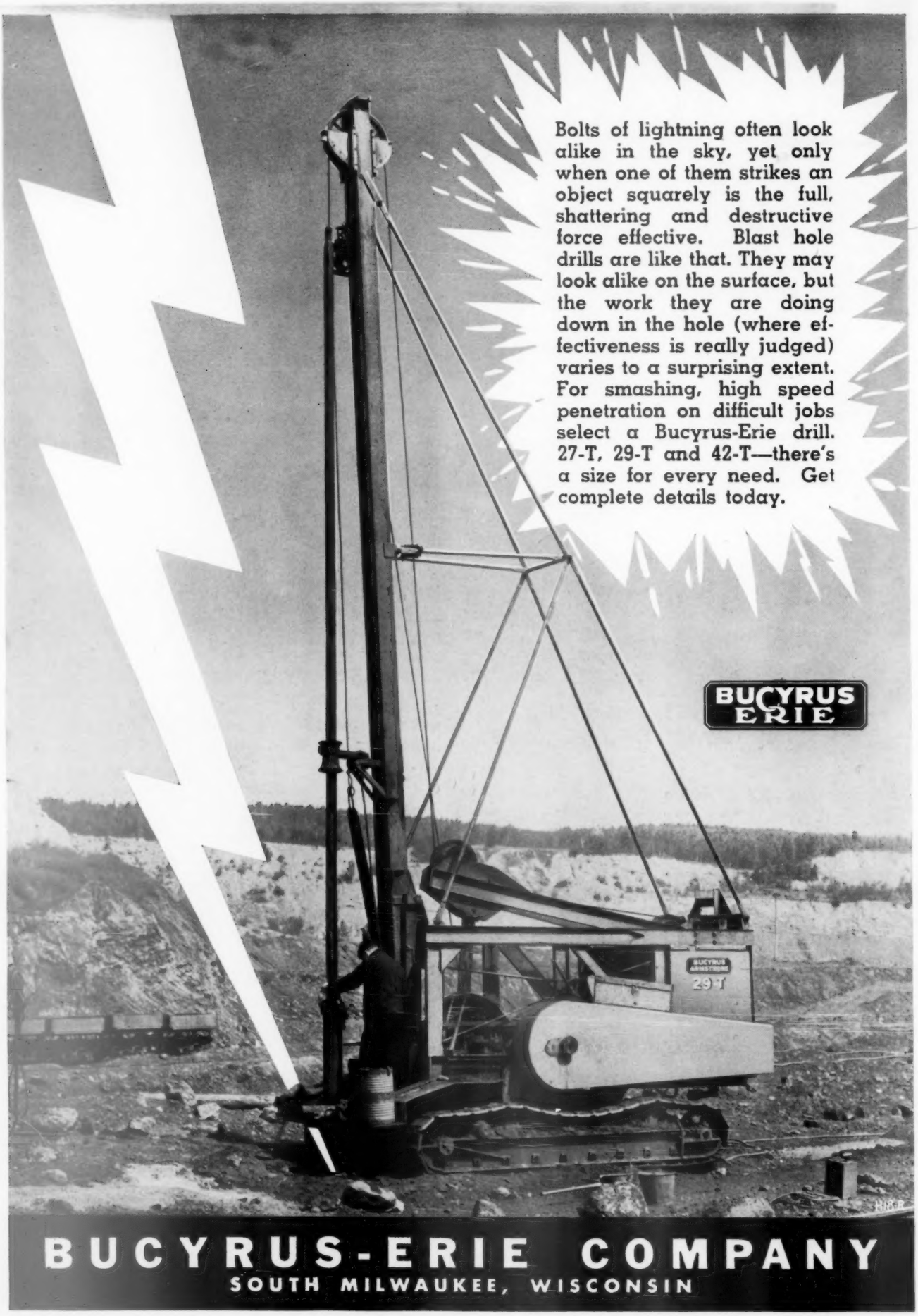


← G-E Type KT, 10-hp, 600-rpm induction motors driving roll grizzlies through reduction gear

→ G-E Type MT, 900-rpm, wound-rotor motors driving crushers

E L E C T R I C

011-512


Bolts of lightning often look alike in the sky, yet only when one of them strikes an object squarely is the full, shattering and destructive force effective. Blast hole drills are like that. They may look alike on the surface, but the work they are doing down in the hole (where effectiveness is really judged) varies to a surprising extent. For smashing, high speed penetration on difficult jobs select a Bucyrus-Erie drill. 27-T, 29-T and 42-T—there's a size for every need. Get complete details today.
BUCYRUS ERIE
29-T
BUCYRUS-ERIE COMPANY
SOUTH MILWAUKEE, WISCONSIN

USE J&L *Precisionbilt* GILMORE WIRE ROPE FOR SAFETY AND ECONOMY

When your hoists, inclines, cutters, loaders and other units are equipped with J & L Precisionbilt Rope you are sure of low cost operations plus the maximum safety factor available.

Precisionbilt mine and quarry ropes are made exclusively of J & L Controlled Quality Steel — on the world's newest wire rope making machines which work to tolerances of 1/1000 of an inch. Lubrication of every strand is perfect because it is applied scientifically. Each man in our employ is skilled in his job and works with the knowledge that human life may depend on every rope he makes.

J & L Precisionbilt Gilmore Ropes for mine and quarry equipment have the safety, strength, flexibility and abrasion-resistance to give you long satisfactory service. Write today for your copy of our catalog of mine and quarry ropes.

JONES & LAUGHLIN STEEL CORPORATION

GILMORE WIRE ROPE DIVISION

MUNCY, PENNSYLVANIA

J&L STEEL

J & L — PARTNER IN PROGRESS TO AMERICAN INDUSTI

THE OUTSTANDING TRUCK FOR THE MONEY

FORD V-8 FOR 1940

FORD FEATURES FOR 1940

New styling • Increased engine accessibility Increased chassis accessibility • Choice of power—95, 85, 60 hp • 42 body and chassis types • New Sealed-Beam Headlamps • Bigger batteries, larger generators with automatic voltage regulation • Big hydraulic brakes • Full-floating rear axle with straddle-mounted pinion and ring gear thrust plate Two-speed axle (optional at extra cost) Ford Engine and Parts Exchange Plan.

The big new 1940 Ford Truck line gives you value in construction, performance and economy that means "the outstanding truck for the money."

Three eight-cylinder engine sizes—95, 85 and 60 hp. Six wheelbases. 42 body and chassis types.

There's new styling. New engine and chassis accessibility, making it easier to check the oil, service the distributor and other engine accessories, as well as clutch, transmission and rear axle. New, softer, more comfortable seats in Regular cabs. These and many more improvements join a host of time-tested, time-proved Ford features in 1940.

See the new Ford Truck at your dealer's. Compare it with any other truck. Arrange for an "on-the-job" test and know the difference before you spend another truck dollar.

Ford Motor Company, Builders of Ford V-8 and Mercury Cars, Ford Trucks, Commercial Cars, Station Wagons, Transit Buses

new 604

A NEW SHOVEL BY KOEHRING . . . new design, modern construction with many features for lower operating and maintenance costs . . . increased yardage . . . more operating ease. Enclosed gears running in oil, anti-friction bearings, forced-feed lubrication, welded construction, less weight, greater strength, high speed are a few of the important reasons why the new Koehring 604 is a profitable investment. A new catalog, giving complete description of this new Koehring Shovel, illustrates the outstanding progress made in shovel design. Write for it today.

KOEHRING CO.
MILWAUKEE • WISCONSIN

- HIGH SPEED
- ENCLOSED GEARS
- ANTI-FRICTION BEARINGS
- WELDED CONSTRUCTION
- LIGHT WEIGHT

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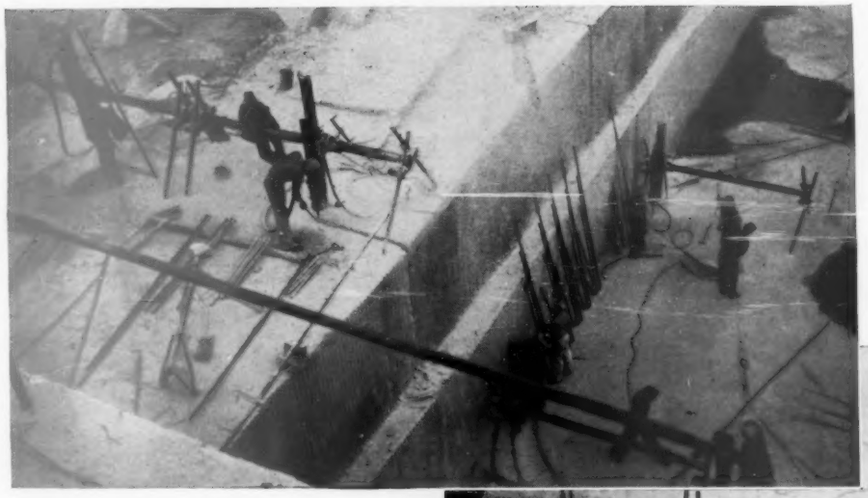
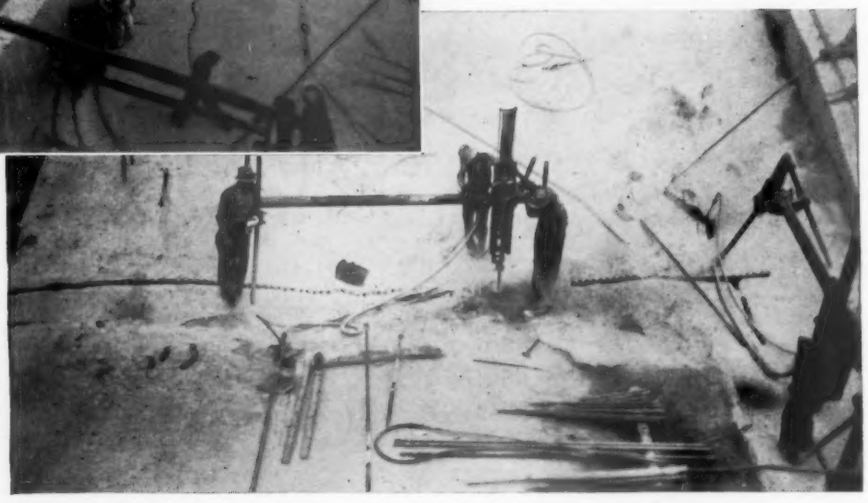
HEAVY-DUTY CONSTRUCTION EQUIPMENT

TIMKEN BITS Reduce The Cost Of Quarrying Granite Blocks





All quarrying at the Allen-Logan Granite Quarry, Elberton, Georgia, is done with TIMKEN Rock Bits.

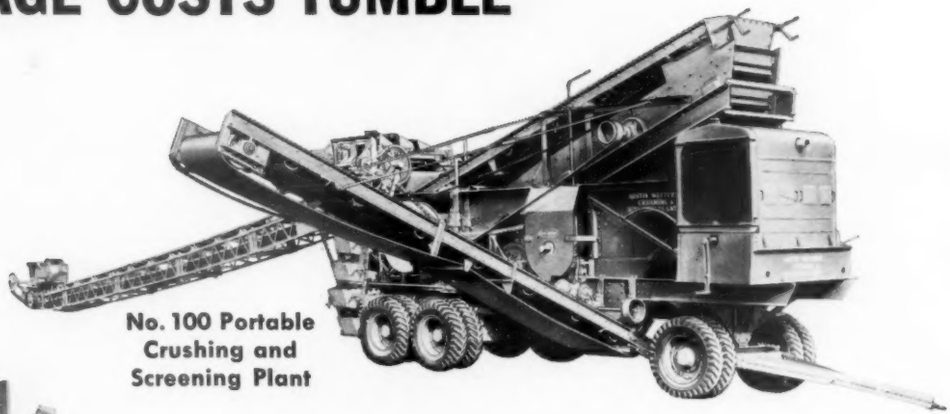
Cutting out blocks of granite for building and monumental purposes is a job that demands accuracy as well as stamina in the drilling equipment. The operators of the Allen-Logan Granite Quarry have found that they can drill faster, straighter and get more footage of hole per bit with TIMKEN Bits. That means they can produce more blocks per day —consequently lower cost per block.

Wherever there is rock to be drilled—in quarries, mines or construction work—this modern rock-drilling tool saves time and money for its users. *You* can have these advantages *now* by getting in touch with the nearest Authorized Distributor. Write for his name and address.

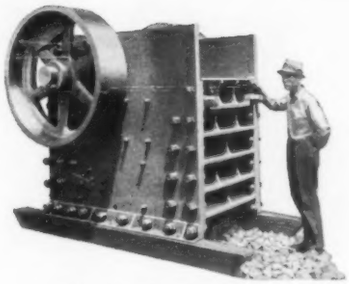
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN
ROCK BITS

. . . ENGINEERED TO MAKE YARDAGE COSTS TUMBLE

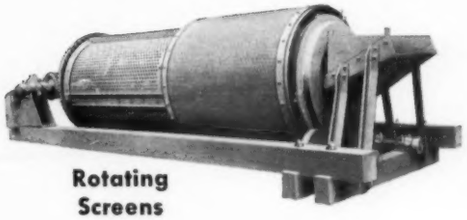


No. 100 Portable Crushing and Screening Plant

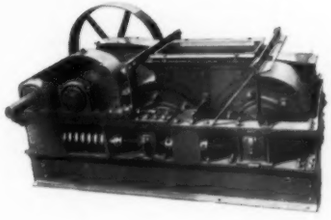


No. 1838 Heavy Duty Crusher

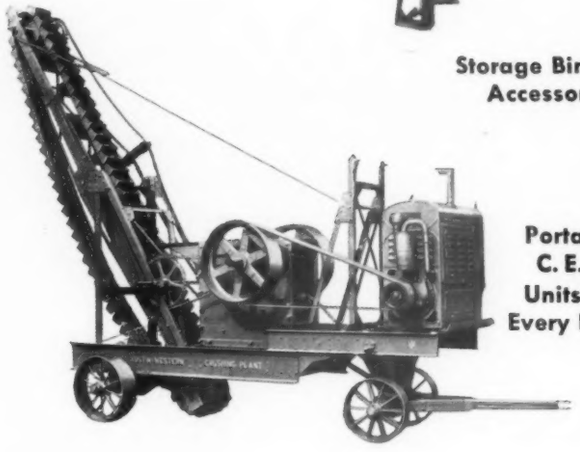
Storage Bins and Accessories



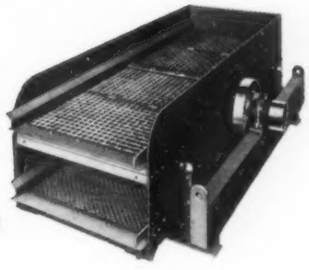
Rotating Screens



No. 3018 Roll Crusher



Portable C. E. P. Units for Every Need



Two-Deck Gyrating Screen

Austin-Western Crushing, Screening and Storage Equipment . . . built to the exacting specifications of experienced crusher engineers . . . includes sizes and types best suited to every location, operating condition, and capacity requirement.

Performance records under the widest variety of pit and quarry conditions have demonstrated the money-saving value of the design and construction advantages of A-W Equipment. All units are engineered to operate smoothly and economically at higher speeds—to produce a larger output of accurately sized stone. As a result, users everywhere report substantial savings over equipment formerly used.

Operators of both stationary and portable plants will find it decidedly worth while to investigate the cost-saving A-W design and construction features . . . and to draw on the broad experience of A-W engineers in planning a plant layout that will assure delivery of accurately sized material at the job at the lowest possible cost. The Austin-Western Road Machinery Co., Aurora, Illinois.

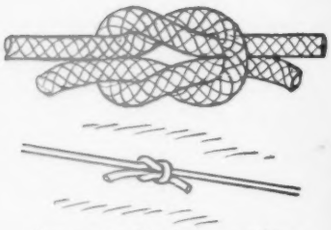
AUSTIN-WESTERN

Motor Graders
Roll-A-Planes
Rollers
Snow Plows

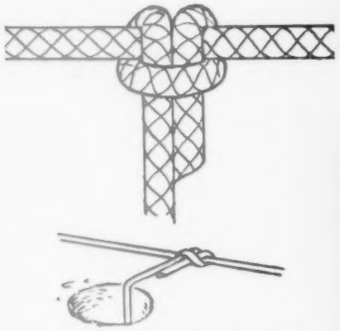
Crushing and Screening Plants
Washing Plants
Blade Graders

Motor Sweepers
Shovels and Cranes
Bituminous Distributors
Elevating Graders

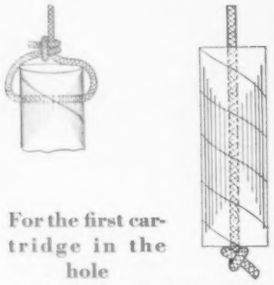
5-Yard Tractor-Scraper
6-Yard Tractor-Scraper
8-Yard Tractor-Scraper
12-Yard Hydraulic Scraper



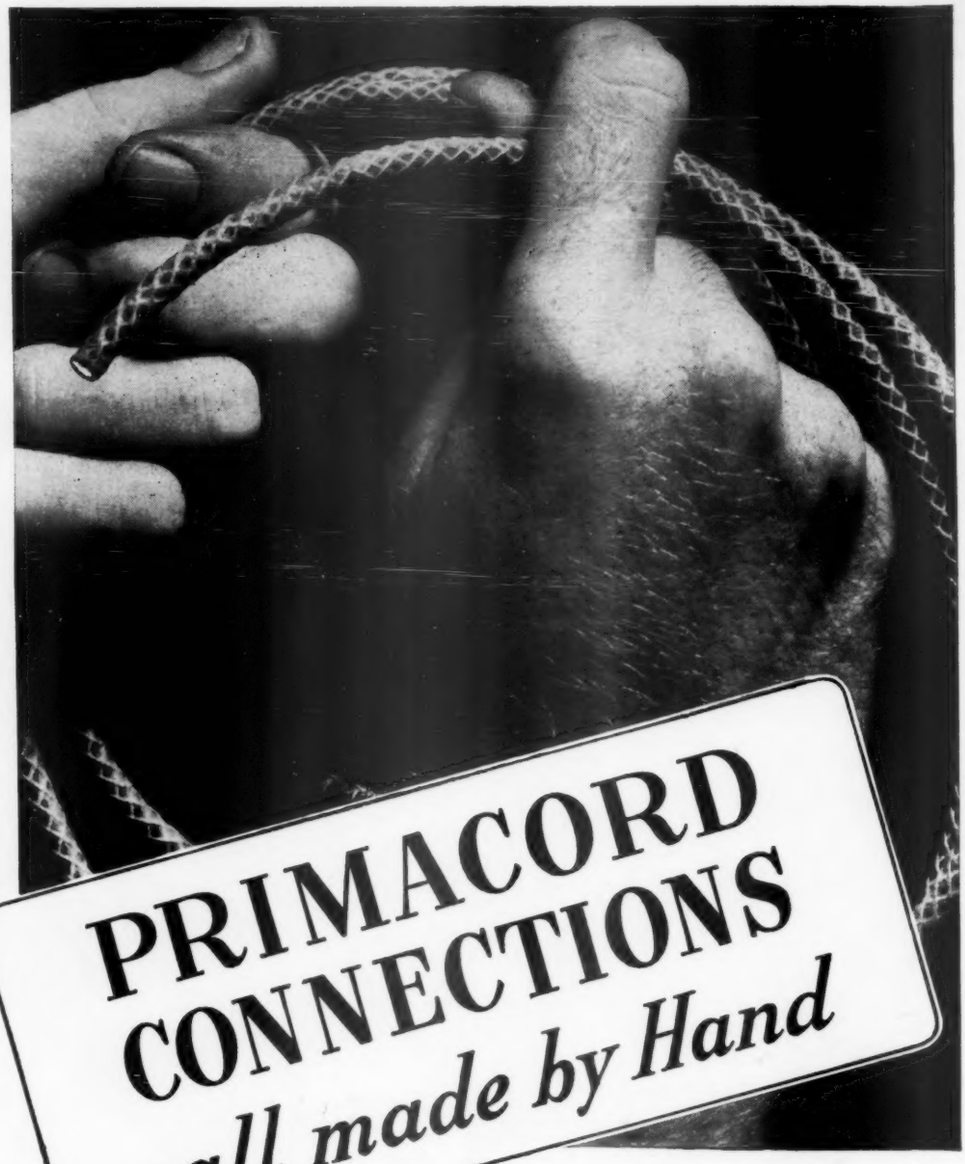
For main line connections use a square knot



For branch-to-main line connections use a half hitch



For the first cartridge in the hole use either of these tied connections. First make sure that the Primacord is long enough to reach from the bottom to the top of the hole. Spliced or knotted Primacord should not be used in a drill hole, as the exposed ends might come in contact with water under pressure.



PRIMACORD CONNECTIONS ..all made by Hand

Simple, isn't it! For the main line use a square knot. For branch-to-main line use a half hitch. For the first cartridge in the hole use either of the methods shown, with a *continuous* length of Primacord, having *no* connections.

Primacord-Bickford is the *improved* Detonating Fuse with a flexible, waterproof textile cover. It is light, strong, easily handled, and "goes" at a speed of 20,350 feet per second!

Send for a free copy of the Primacord-Bickford book. It opens the door to new efficiency and profits in blasting.

The ENSIGN-BICKFORD COMPANY · Simsbury, Connecticut · U. S. A.
Makers of Cordeau-Bickford Detonating Fuse and Safety Fuse since 1836.

PRIMACORD-BICKFORD *Detonating Fuse*

PB 13

DON'T LET SHEAVES *SHIMMY* IF YOU WANT ROPE SAFETY!

YES, THOSE seemingly unimportant wire rope sheaves of yours—sheaves that perhaps are hidden away, out of sight—have a lot to do with the safety of your wire rope and the life you get from it!

For example, do your sheaves "shimmy"? If so, remember that's the signal for sheave misalignment—the result of abnormal bearing wear due to improper lubrication. And excessive rope wear follows.

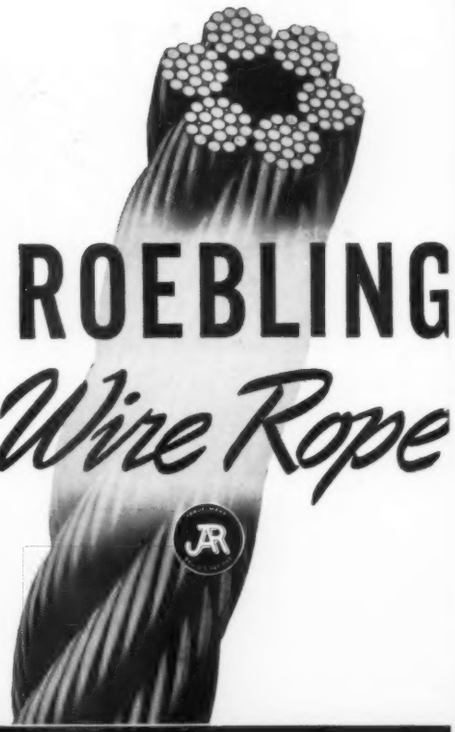
Then, too, when rope sheaves are neglected there are other dangers. Bearings may "freeze" because of improper lubrication or become jammed—and this means that flat spots will be worn in the sheaves by the rope.

Or your sheave grooves may not run true—causing rope wobble. Or the sheaves may be too small or too soft. At any rate, all of these things accelerate rope wear—reduce rope safety.

Periodical inspection and proper maintenance of wire rope sheaves pays big in wire rope service and safety! For full information regarding proper sheave maintenance practice, to meet your own individual requirements, consult the nearest Roebling Office.

This advertisement is published in the interest of all wire rope users, to help them obtain greater safety, service and efficiency from their wire rope.

JOHN A. ROEBLING'S SONS COMPANY
Trenton, N. J. *Branches in Principal Cities*



ROEBLING "BLUE CENTER" WIRE ROPE

...THAT SHEAVE HAS CHEWED UP ITS LAST WIRE ROPE!

FROM THE DAILY REPORT OF A
TIGER BRAND WIRE ROPE ENGINEER

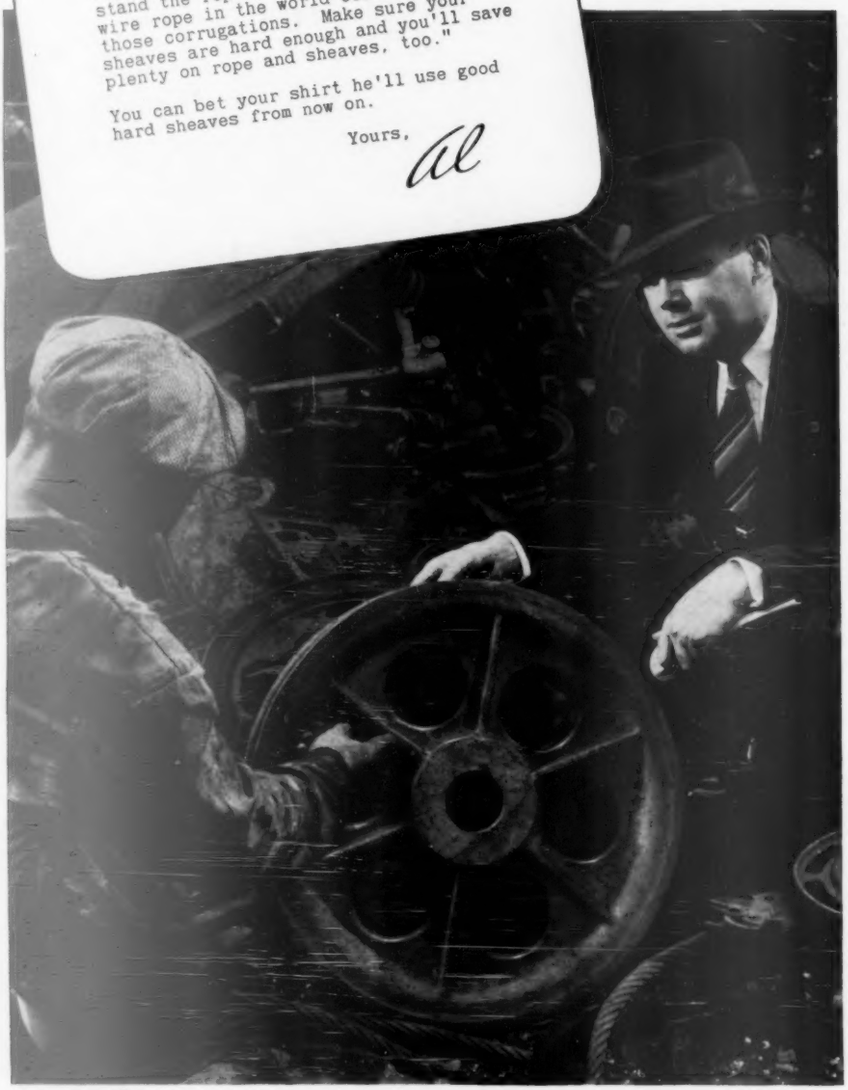
No sooner stepped in here this morning when the super had me by the arm. "Come with me," he said, "I want to show you something."

At the scrap pile he pointed at a discarded sheave. "There's a sheave that has chewed up its last wire rope," he said. "Only a few months old but it's already ruined two ropes."

I could see it was badly corrugated. "The trouble with that sheave," I told him, "is that it wasn't hard enough to stand the rope pressure. Why, the best wire rope in the world couldn't last on those corrugations. Make sure your sheaves are hard enough and you'll save plenty on rope and sheaves, too."

You can bet your shirt he'll use good hard sheaves from now on.

Yours,
Al



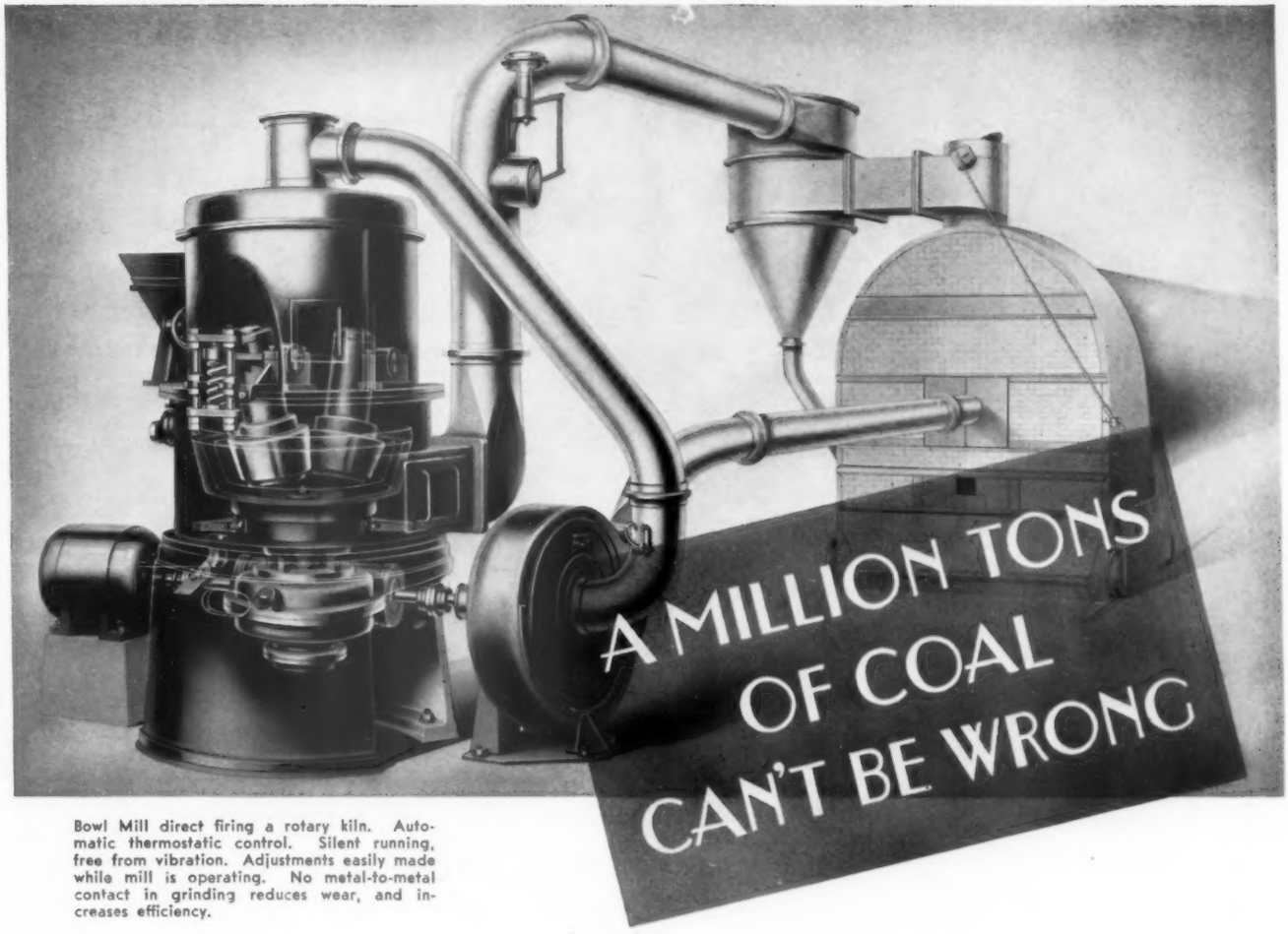
THE material from which a sheave is made should be hard enough to withstand the wear caused by the pressure of the rope on the sheave groove. Sheaves made from too soft material not only wear rapidly, but also shorten the rope life, because the deepened grooves do not provide working clearances for the rope. The resultant pinching of the rope imposes a binding action which prevents proper load distribution, and causes excessive internal and external friction. Corrugations from strand and wire impressions further reduce rope life by accelerating wear.

Limiting values of the pressure between a rope and sheave to secure satisfactory service have been established for all common materials from which sheaves are manufactured. If you are encountering undue sheave wear, our Engineering Department will gladly help you determine the pressure on your sheaves and make money-saving recommendations based on these standards.

USS
EXCELLAY *Preformed*
WIRE ROPE

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
COLUMBIA STEEL COMPANY
San Francisco
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



Bowl Mill direct firing a rotary kiln. Automatic thermostatic control. Silent running, free from vibration. Adjustments easily made while mill is operating. No metal-to-metal contact in grinding reduces wear, and increases efficiency.

WE made a careful survey of seven rotary kiln plants, employing a total of twenty-four Raymond Bowl Mills, and obtained authenticated figures from the operating engineers, which showed:—

That these 24 direct firing units have pulverized over a million tons of Pennsylvania and West Virginia coal to an average fineness of 83 per cent passing a 200-mesh screen and that the overall power consumed has averaged 17.3 kilowatt hours per ton, while the cost of repair parts was less than one cent per ton of coal pulverized.

It is this performance, maintained in actual service, that enables Bowl Mill users to reduce their operating costs far below former levels. Every rotary kiln operator should inquire into the economies of the Bowl Mill.

Ask for Catalog No. 43

BOWL MILL

See the Bowl Mill operating before you decide on direct-firing. Ask for list of installations nearest you.

RAYMOND PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, INC.
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Readers and Advertisers Alike Prefer PIT AND QUARRY

For nearly a decade Pit and Quarry has led the field in subscriptions among producers. Its popularity has grown constantly, its margin of lead increased steadily, not by any sudden bound due to special offers or inducements. Its volume of advertising in 1938 was definitely larger than that of any other paper in the field.

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PIT AND QUARRY PUBLICATIONS,
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Enclosed find remittance for which enter my subscription to Pit and Quarry for.....
1 year ($1.00) .....starting with the October issue. (Foreign add $1.00 per year.)

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Company Name .....

Send to (Address).....

We Produce..... .....

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What such companies as those listed here have done it will pay *you* to do. More than 1100 companies today are using Buell's Van Tongeren system for dust collection or fly ash correction. Reorders regularly follow as new needs arise.

Buell Collectors combine the low-cost, trouble-free service of the cyclone with the high over-all efficiency of the patented Van Tongeren design. Investigate, and you will find that Buell Collectors give you the maximum return on your investment.

INVESTIGATE BUELL AND *save money!*

FOR INFORMATION on dust collection ask us for *Bulletin D81;* on fly ash, for *Booklet A93.* Either, or both of these will be sent free to any managing executive or operating engineer.

BUELL ENGINEERING COMPANY INC

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Wherever you are located you will be quickly served through sales offices of either BUELL ENGINEERING CO. or B. F. STURTEVANT CO.

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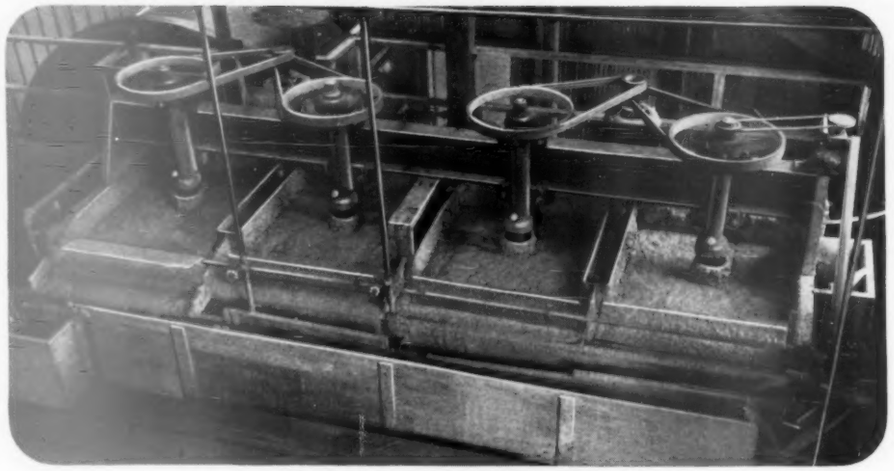
DUST COLLECTORS

BENEFICIATION AND CONCENTRATION PROBLEMS

Solved with Denver "Sub-A" Flotation



WHAT IS FLOTATION?

FLOTATION . . . a separation of minerals which takes place in water (or a solution) in which the solid particles are suspended, and results from the adhesion of some species of solids to gas bubbles which are generated or introduced in the pulp, and the simultaneous adhesion of other species of solids to the water in which they are suspended. Flotation of the solids adhering to the bubbles permits their removal from the pulp as a froth of different composition from the pulp. The specific gravity of the minerals is not the factor which effects the separation.

In point of tonnage treated, flotation is leading all other methods of non-ferrous ore concentration. Last year in the United States, of the 60 million tons of ore produced, over 75% was concentrated by flotation alone or in combination with gravity methods.

The flotation process has been found equally as effective for the concentration and beneficiation of "non-metallic" minerals. It has been applied commercially to a wide variety of such minerals and has proven very successful.

As Flotation Engineers - Ask us how we can increase your PROFITS

FLUORSPAR of acid grade (over 98% calcium fluorite) has been produced in unlimited quantities only since flotation was applied.

PHOSPHATES are being recovered by the flotation process in Florida and Tennessee in grade as high as 75% bone phosphate of lime.

KYANITE. By flotation methods, it is possible to prepare Kyanite of 97% to 98% grade, whereas gravity concentrates rarely exceed 90% in purity.

SALT CRYSTAL MIXTURES. A novel commercial adaptation of froth flotation in mother liquor has come in the separation of potassium chloride and sodium chloride crystals from each other where suspended in a saturated brine.

GRAPHITE. A crystalline flake graphite and amorphous graphite can be recovered in commercial grades of 90% and higher.

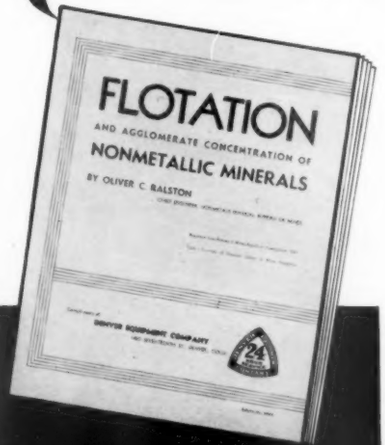
SULPHUR. Ores which are low in sulphur content can be treated by flotation with the production of a product of high purity.

TALC is being concentrated from talc-magnesite ores, and a product of over 95% purity is obtained.

COAL. Both bituminous and anthracite fines are being beneficiated by flotation with the elimination of as high as 80% of the high ash and sulphur impurities.

SILICA SANDS are treated by flotation for the removal of most impurities which have defied other methods or processes for removal.

WRITE TODAY for this valuable Bulletin No. 38M4 on Flotation of Non-metallic Minerals.



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SANTIAGO, CHILE: Clasificador F-485
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1400 SEVENTEENTH STREET, DENVER, COLORADO

NOV 13 1939

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PIT AND QUARRY

Vol. 32 October, 1939 No. 4

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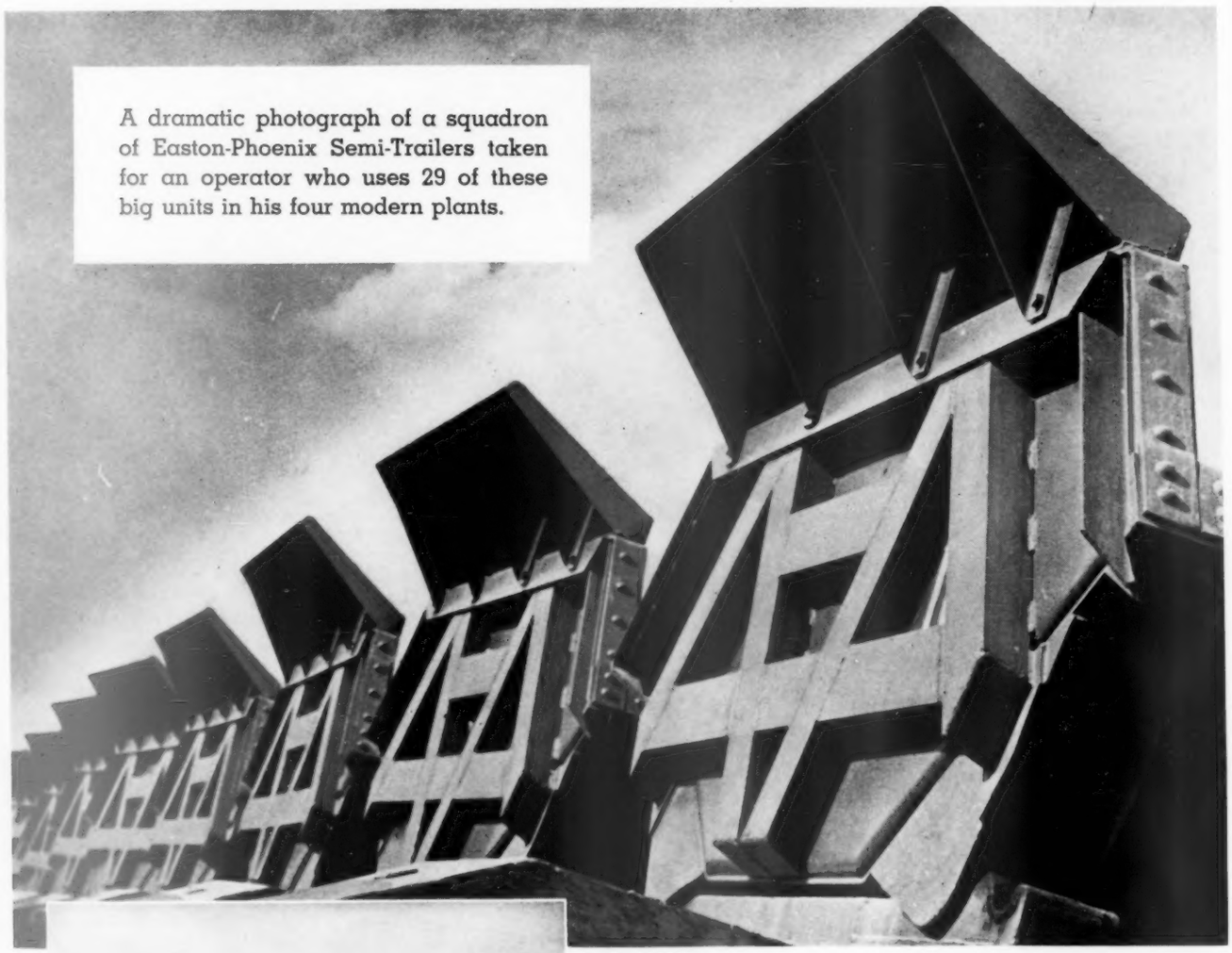
Bigger Payloads

with another great fleet of EASTON-PHOENIX TRAILERS



A dramatic photograph of a squadron of Easton-Phoenix Semi-Trailers taken for an operator who uses 29 of these big units in his four modern plants.

Above is shown a full view of an Easton-Phoenix Model TR-10 mounted over a Mack Model EG Quarry Tractor—a combination that is setting new records for efficiency in quarry haulage.

BIGGER PAYLOADS! Isn't that all the answer you need for greater efficiency in your haulage system?

Easton-Phoenix Semi-Trailers have gone whole-hog for Bigger Payloads. They are hauling more rock, faster and at lower cost than ever before on every installation. They permit the use of lighter tractors for bigger loads. They give you new patented features which increase dumping speeds while putting less strain on body and trailer and no strain on the tractor. They answer every demand so directly that experts are saying, "Why wasn't it done long ago?" Write today for data.

EASTON CAR & CONSTRUCTION COMPANY, EASTON, PA.

ALL TYPES OF CARS, TRUCK BODIES, AND TRAILERS FOR ROCK HANDLING

Safety Congress to Convene October 16

REVEAL CEMENT, QUARRY TOPICS

The annual Safety Congress of the National Safety Council is scheduled for October 16-20 in Atlantic City. Men and women from all over the United States will gather together on that occasion to discuss safety problems. Individuals, communities, companies, and industries—even nations—all unite in this common effort to learn why accidents happen, what causes them, and how they can be prevented. They combine their time and efforts to prevent suffering and economic waste and by doing so endeavor to make this country privately, publicly, and industrially, a better and safer place in which to live.

High spots on the program of the Cement and Quarry Section, which meets on October 17 and 18 are as follows:

"Analysis of Cement and Quarry Industry Accident Experience," A. J. R. Curtis, Assistant General Manager, Portland Cement Association, Chicago.

"Building Safety Into the Plant (Open Forum)," led by David Adam, Safety Engineer, Lawrence Portland Cement Company, Northampton, Pennsylvania.

"First Aid for Quarry Workers," Dr. L. M. Thompson, Assistant Director, American Red Cross, Washington, D. C.

"Effective Safety Work in a Heavy Industry," Lea P. Warner, Jr., Industrial Relations Manager, Warner Company, Philadelphia.

"Safe Handling of Explosives," C. H. Fisher, E. I. du Pont de Nemours & Company, Wilmington, Delaware.

Detroit Gravel Concern Installs New Equipment

New processing and excavating equipment has been installed at the Northville, Michigan, plant of the Manning & Locklin Sand and Gravel Company, according to Charles R. Locklin, of Detroit, president of the company.

Daily capacity of the plant is now 1,200 cubic yards.

Makes Drilling Tests on Gypsum in Nevada

Diamond drilling on a huge gypsum property opposite Lovelock, Nevada, has been started by the United States Gypsum Company, after a preliminary survey by a company engineer and the construction of a road to the property.

The principal deposits are in two mountains that appear to be of yellowish color. Huge shipments were made from both of these properties a generation or more ago.

The Pacific Portland Cement Company also is said to hold large reserves of gypsum in the vicinity.

Coming Events

October 16-20, 1939—Atlantic City, N. J. Annual congress and exposition, National Safety Council.

October 20, 1939—Chicago, Ill. Semi-annual meeting, board of directors, National Industrial Sand Association, Palmer House.

January 17-19, 1940—St. Louis, Mo. Annual conventions, National Sand & Gravel Association and National Ready Mixed Concrete Association, Jefferson Hotel.

January 22-24, 1940—St. Louis, Mo. Annual convention, National Crushed Stone Association, Jefferson Hotel.

February 12-14, 1940—Washington, D. C. Annual conventions, National Concrete Masonry Association and Cast Stone Institute, Mayflower Hotel.

Attack Use of Chert Gravel in Kentucky

BLAMED FOR PAVEMENT FAILURE

Chert gravels have been brought to the front recently by a paper by Curtis Cantrill and Louis Campbell of the Kentucky State Highway Department presented before the last annual meeting of the American Society for Testing Materials. The paper, entitled *Selection of Aggregates for Concrete Pavement Based on Service Records* summarized the results of some laboratory tests and of a survey of approximately 1,100 miles of concrete pavement. The conclusions reached by the authors, based on their study of Kentucky roads and Kentucky aggregates are the following:

1. The failure of concrete pavement throughout the western part of the state was due to the use of chert gravel obtained from the Tennessee and Cumberland Rivers in western Kentucky.

2. With the present methods of pavement construction, chert gravel will not produce durable pavement.

3. Chert gravel, which was found to produce unsatisfactory pavement in Kentucky, may be eliminated by two specifications:

   (a) Coarse aggregate shall not show an absorption greater than 3 per cent. when subjected to A.S.T.M. Standard Test C 95-36.

   (b) Concrete in which any aggregate is incorporated shall not show a reduction in flexural strength greater than 30 per cent. when subjected to 40 cycles of freezing and thawing in the presence of water.

4. Tennessee or Cumberland River sand will produce durable pavement when used with Ohio River gravel or crushed limestone.

5. The use of sandstone as both fine and coarse aggregate resulted in unsatisfactory pavement.

6. The use of sandstone and Ohio River sand as aggregates resulted in satisfactory pavement.

Mathieson Explains Leasing of Deposit

NO PROFIT IN CRUDE MATERIAL

A sidelight on the economics of the gypsum industry is the recent leasing (June 1, 1939) by the Mathieson Alkali Company of its North Holston, Virginia, gypsum plant to the National Gypsum Company. In a letter to stockholders, President E. M. Allen, of the former company, says, "We were confronted with the condition of either increasing our investment to include a full line of gypsum products or leasing the property to a company that had such facilities."

Bureau of Mines' figures show a progressive increase in average sales value per ton of gypsum mined by domestic producers, from $2.74 in 1910 to $9.67 in 1936. The increase in these averages, which are computed by dividing total sales value of gypsum products by number of tons produced, is due in only a negligible degree to increased prices for crude gypsum, which recently has been sold to cement plants at an average of about $1.80 a ton, compared with the 1910-1914 average of $1.45. Crude gypsum never has been a high-priced product, and mining companies found that their best assurance of growth lay in processing their product and selling to ultimate consumers rather than in trying merely to sell more crude gypsum. Variable amounts of gypsum are still sold raw for Portland-cement retarder, land plaster (fertilizer and soil conditioner), and miscellaneous uses. But the value of crude gypsum sales these days seldom accounts for much more than five per cent. of the total sales of gypsum products in the United States. Building plasters (calcined gypsum mixed with suitable other ingredients and packed in bags) still represent the mainstay of the industry. Ordinary plaster fetches about four times as much as raw gypsum, and wallboard, gypsum lath, tile, and other more highly manufactured products, which sell for the equivalent of $20 to $30 a ton, boost the sales value of a ton of gypsum as much as 15-fold. As manufacturing has so outstripped in importance the mining activities of the gypsum companies, several of them have gone into other building-material lines, such as fiber board, lime, cement, and rock wool.

RECENT GOVERNMENT CONTRACTS FOR MATERIALS UNDER THE PUBLIC CONTRACTS (WALSH-HEALY) ACT

Date of Delivery 1939	Source of Supply	Government Agency	Commodity	Amount
9/30	M. F. Hickey Co., Inc., Brooklyn, N. Y.	Navy	Ready-mixed concrete	$14,715.00
12/31	Pioneer Sand & Gravel Co., Seattle, Wash.	Navy	Ready-mixed concrete	16,089.00
12/31	Cerulean Stone Co., Cerulean, Ky.	Agriculture	Limestone	Indefinite
12/31	Hopkinsville Stone Co., Hopkinsville, Ky.	Agriculture	Limestone	Indefinite
12/31	Cedar Bluff Quarry, Princeton, Ky.	Agriculture	Limestone	Indefinite
12/31	H. G. Fenton Material Co., San Diego, Cal.	Navy	Crushed rock and sand	27,790.00
12/31	O'Brien Bros., Hudson, N. Y.	W. P. A.	Broken stone	12,550.00
6/30/40	Lehigh Cement Co., Buffalo, N. Y. Huron Cement Co., Buffalo, N. Y. Federal Cement Co., Buffalo, N. Y.	W. P. A.	Cement	49,250.00
3/1/40	Santa Cruz Portland Cement Co., Davenport, Calif.	War, Engineer	Cement	358,700.00
1/31/40	D. U. Smith & Brother, Ashley Falls, Mass.	Agriculture	Limestone	Indefinite
1/31/40	Rockland-Rockport Lime Co., Inc., Rockland, Me.	Agriculture	Limestone	Indefinite
1/31/40	Lawrence Portland Cement Co., Thomaston, Me.	Agriculture	Limestone	Indefinite
11/30	Conklin Limestone Co., Inc., Canaan, Conn.	Agriculture	Ground limestone	Indefinite
11/30	D. U. Smith & Bro., Ashley Falls, Mass.	Agriculture	Limestone	Indefinite
11/30	Lee Lime Corp., Lee, Mass.	Agriculture	Limestone	Indefinite
1/31/40	Champlain Valley Lime Co., Winooski, Vt.	Agriculture	Ground limestone	Indefinite
1/31/40	Lee Lime Corp., Lee, Mass.	Agriculture	Pulverized limestone	Indefinite
1/31/40	Hoosac Valley Lime Co., Inc., Adams, Mass.	Agriculture	Ground limestone	Indefinite
10/13	Colonial Sand & Stone Co., Inc., New York, N. Y.	W. P. A.	Grits	10,497.50
8/10	Gallagher Bros. Sand & Gravel Corp., New York, N. Y.	Navy	Fine aggregate	13,400.00
Indef.	Barrett Line Quarries, Inc., Cincinnati, O.	War, Engineer	Riprap	183,250.00
12/31	Hopkins Bros., Inc., Lebanon, Mo.	W. P. A.	Portland cement	15,600.00
Indef.	Northwestern Portland Cement Co., Seattle, Wash.	Procurement	Portland cement	Indefinite
Indef.	Boston Sand & Gravel Co., Cambridge, Mass.	W. P. A.	Ready-mixed concrete	45,412.50
11/29	J. & I. O'Rourke, Inc., Flushing, N. Y.	W. P. A.	Ready-mixed concrete	65,790.00
11/29	Posnak & Turkish, Inc., Bayonne, N. J.	W. P. A.	Portland cement	10,940.00
9/15	O'Brien Bros., Cold Springs, N. Y.	W. P. A.	Broken stone	22,700.00
11/19	Miami Oolite Rock Co., Miami, Fla.	W. P. A.	Lime rock	3,1200.00

One of a fleet of seven 9-cubic yard dump trucks recently placed in service at one of the quarries of the Bethlehem Steel Co. These trucks have all-welded bodies of "Mayari R," Bethlehem's high-strength, corrosion-resistant steel alloy. A weight reduction of about 700 pounds was attained through the use of this steel.

Few Silicosis Claims from Quarries in Ohio

The bulletin of the Industrial Commission of Ohio reports that a check of silicosis claims allowed by the Commission from July 31, 1937, the date silicosis was added to the list of compensable occupational diseases, to June 26, 1939, shows that a total of 65 silicosis claims have been favorably considered by the Commission, and that 33, or 50.8 per cent. of them, originated in foundries; 24, or 36.9 per cent., in the ceramics industry; 5, or 7.7 per cent., in cut-stone operations and 3, or 4.6 per cent., in miscellaneous plants.

"The figures given do not necessarily indicate that silicosis hazards are more pronounced in the industries having the highest percentage of approved claims, since the extent of exposure, as represented by the number of persons employed, must be taken into consideration," the bulletin states.

"The check of silicosis claims is but one of the steps being taken by the division to gather data on dust hazards in Ohio industries and to devise approved methods for their elimination."

The former plant of Chautauqua Cinder Block, Inc., Jamestown, New York, has been acquired by Gerald F. Conroe, concrete-products operator at Bradford and Emporium, Pennsylvania.

Contract Volume Is Still on Increase

GAINS 26% OVER LAST YEAR

Construction contract volume in August increased substantially over both June and July, according to F. W. Dodge Corporation. The total for the 37 Eastern states, amounting to $312,328,000, was practically equal to the figure for August, 1938, in spite of the current tapering of the public works program. During the first eight months of this year, total contracts awarded amounted to $2,311,575,000, which represents a 26 per cent. increase over the same period last year and is the highest total recorded since 1931.

Residential contracts awarded in August amounted to $127,163,000. With the exception of May of this year, this monthly total is the highest since October, 1929, and represents a 28 per cent. increase over August, 1938. The cumulative total of residential building for the first eight months of this year is the highest of any comparable period since 1929 and is 50 per cent. greater than the total for the same months of 1938.

In terms of better housing conditions, there were 68 per cent. more dwelling units provided for during 1939 to date than in the comparable period last year. Small residential construction, including one-and two-family houses, and large residential construction each showed approximately the same increase in the number of dwelling units during the same period. Small residential building, however, accounted for 65 per cent. of the total of all dwelling units constructed in 1939 to date.

Publicly-owned residential projects contributed appreciably to the dwelling unit increase in large residential construction. However, the dollar volume of publicly-owned residential projects amounted to only 13 per cent. of the total residential construction recorded during the first eight months of 1939.

Vermiculite Operations Gain as Use Increases

The Black Hills Mining & Industrial Association, near Glenrock, Wyoming, recently installed new mining and processing equipment for further development preparatory to establishing a vermiculite refinery plant and marketing facilities in Casper, Wyoming.

Uses of vermiculite are increasing and taking new forms, the Bureau of Mines points out. The first extensive use was as loose fill to insulate houses and other buildings against sound and heat. Now it is also used with plaster cement and other binders in a variety of products. It is made into wallboard. For open-hearth furnaces and other equipment requiring insulating cover against high temperatures, plastic mortars are employed, the granules being mixed with special cement and other materials to make refractory concrete. Also on the market is a new insulating brick of vermiculite for furnace construction to be used for temperatures up to 2,000 deg. F.; it cuts easily and is said to compact without breaking under compression. A heavier and stronger type is the bonded block, which may be used for temperatures up to 1,800 deg. F. Vermiculite is sometimes used for its decorative value in stuccoed buildings.

A British patent was taken out last year for a method of reinforcing granules of expanded vermiculite by coating them with liquid or molten carbonaceous material such as tar, pitch, asphalt, etc. The granules may be employed then as a lightweight aggregate for concrete, as insulating material, particularly in the heat-treatment of metals.

Recently the Mellon Institute of Industrial Research announced the results of investigation of a composition of expanded vermiculite and gypsum as a fire-resisting covering for steel. The composition that has been given an official fire-resisting rating of 5 hours, 44 minutes by the National Bureau of Standards may be particularly useful for covering steel beams that otherwise would buckle in intense heat.

The Dunbrick & Dunstone Company, located just north of Duluth Heights, Duluth, Minnesota, started operations June 10, and will install its own gravel washing equipment soon. Carl A. Hendrickson is head of the company.

Bethlehem Changes Quarry Personnel

PEACOCK NOW GENERAL MANAGER

Changes in organization of the raw-materials division, Bethlehem Steel Company, have been announced by C. A. Buck, vice-president.

M. L. Jacobs, formerly general manager of limestone properties, has been appointed assistant to vice-president.

J. P. Peacock has been advanced from superintendent of the Bridgeport quarry to general manager of limestone properties, succeeding Mr. Jacobs.

Mr. Jacobs was graduated at Lehigh University in 1910 and entered the employ of Bethlehem Steel Company in 1916 as superintendent of quarries. He became manager of quarries, Bethlehem Mines Corporation, in 1920, and general manager of quarries, Bethlehem Steel Company, in 1934.

Mr. Peacock started with Bethlehem in 1917, as superintendent of the Steelton Quarry, and in 1924 became superintendent of the Bethlehem Quarry, continuing in that position until 1938 when he was appointed superintendent of the Bridgeport Quarry. He is a graduate of Princeton University, class of 1910.

Allegheny Sand Company Sells Ohio River Fleet

The Allegheny Sand Company of East Liverpool, Ohio, has sold its Ohio River floating equipment to the Zubik Towing Company.

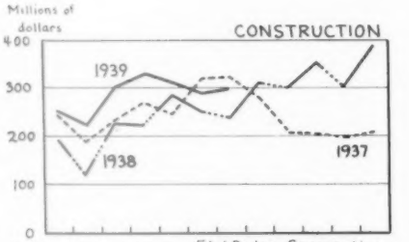
Involved in the sale were two towboats, a dredge, a derrick boat, a crane and thirteen barges.

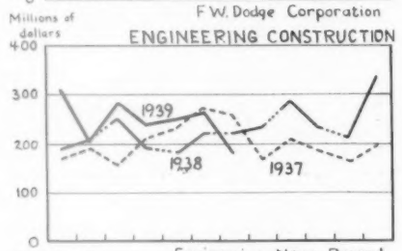
This Caterpillar Diesel-powered Whitcomb locomotive hauls stone from quarry to crusher at the operations of the Wabash Portland Cement Company at Osborn, Ohio, using about 15 cents worth of fuel per hour. There are two such locomotives in service, each hauling about 40 tons per trip. The length of haul is ¾ mile and each train averages 12 round trips daily.

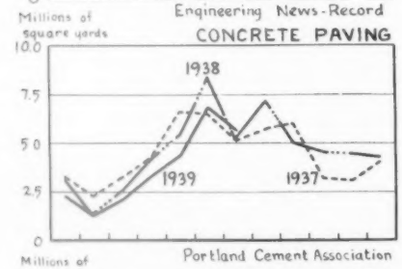
CURRENT BUSINESS INDICATORS

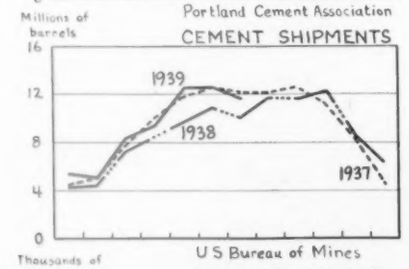
The major uncertainty that tempered forecasts of the outlook for business at the beginning of 1939 was the prospect of war in Europe. This became a reality early in September and with the immediate speculative boom came a sharp rise in commodity and stock prices despite the avowed intention of the Administration to maintain a strict neutrality and take the profits out of war. By the end of September steel production had advanced to more than 80 per cent. of capacity. During the World War steel output was virtually doubled in the first two years and rose only a little higher after the United States entered the conflict. Industrial production in general increased about one third from 1914 to 1918.

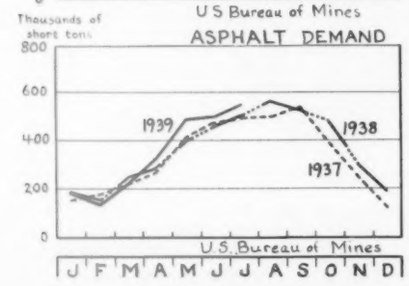
TO fill the gap in current statistics of production of aggregates, ballast, industrial sands, and crushed stone for various uses PIT AND QUARRY introduces in this issue a page devoted to data indicative of the demand for these materials. The charts shown here will be kept up-to-date periodically and additional data of supplementary interest will be presented from time to time. It is believed that producers will find this page of considerable interest in following the trend of business in those fields in which our industries market their products.—DIRECTING EDITOR.











The effect of the present war on the construction industry and production of cement, crushed stone, sand and gravel, gypsum, and lime remains to be seen. It may be of interest, however, to recall that from 1914 to 1917 production of these materials fluctuated only slightly, but in 1918—as the shortage of labor, fuel, and transportation facilities became acute—their output dropped sharply, to recover immediately after the war in the greatest construction boom in history.

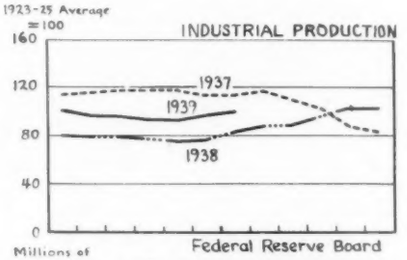
With three-quarters of 1939 now behind us it is evident that many of the forecasts at the beginning of the year were too optimistic but, nevertheless, the index of industrial production shows that business did hold up reasonably well for five months of the year and then in June began an advance which seems to have carried well into September and which is now believed will continue throughout the rest of the year. For the first eight months of 1939 business was more than 20 per cent. above 1938.

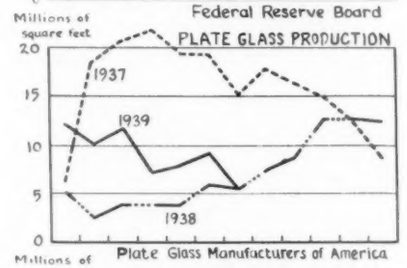
The total value of contracts awarded through July, as reported by the F. W. Dodge Corporation, was well above either 1937 or 1938. Despite the drop in May and June from the April peak, seven months of 1939 exceeded 1938 by 30 per cent. Engineering construction also has been higher in 1939 than in 1937 or 1938, but concrete paving contracts have lagged slightly behind both previous years. Cement shipments for seven months of the year were virtually equal to 1937 and exceeded 1938 by 18 per cent. The demand for asphalt has been strong, apparently indicative of continued activity in the construction of bituminous roads.

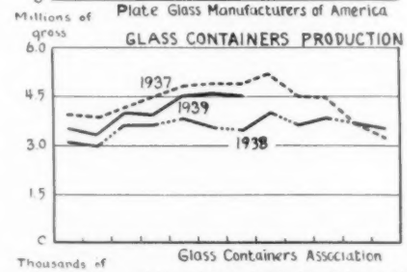
These data indicate that the demand for aggregates in the first seven months of 1939 exceeded the comparable period of 1938 by about 15 per cent.

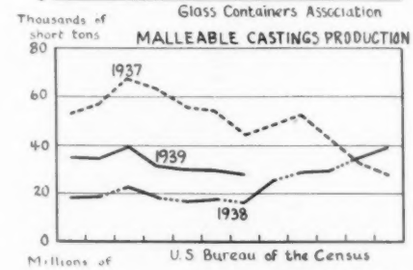
Markets for industrial sands likewise have been relatively active in 1939 compared with 1938. Although plate-glass production has not even approached the record established in 1937 it has been maintained at a level substantially above 1938. With production of glass containers also well above 1938, glass-sand output for the first seven months of the year apparently has exceeded 1938 by as much as 50 per cent. The production of malleable castings, as well as the steel industry in general, has been higher in 1939 than in 1938 and this advance has resulted in an increased demand for molding sand, furnace sand, blast sand, fluxing stone, and other products consumed in steel and related industries. Carloadings have shown the effect of improved business conditions by remaining well above 1938 throughout the first seven months of the year. The demand for engine sand and possibly ballast may have increased accordingly.

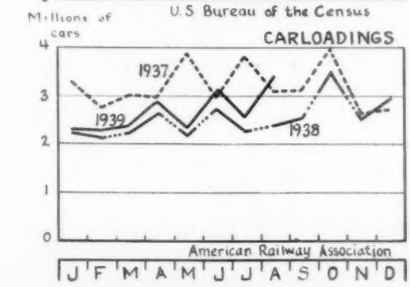
Preliminary indications of business during August and September are quite favorable. What effect any reduction in public expenditures for construction during the rest of the year might have is difficult to evaluate, but the immediate outlook seems to be favorable.











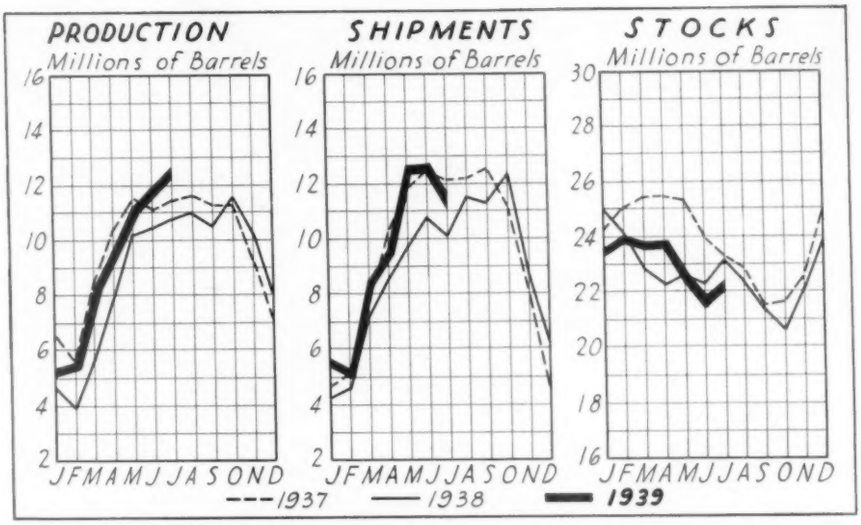
Trend Is Away from Small Lime Plants

BUREAU OF MINES MAKES SURVEY

Owing partly to the popular lament that the poor are getting poorer and the rich, richer, and partly for more practical reasons, it is important to know the optimum size of a plant or company organization in a given industry. Big business in one field would be little business in another.

Oliver Bowles and A. T. Coons of the Bureau of Mines recently completed a study of organization trends in the lime industry, in which they analyzed reports to the Bureau for a 29-year period. Their forthcoming report will show that very small plants, producing less than 1,000 tons a year, now contribute an insignificant and further dwindling percentage of the total output of lime; that medium-sized companies, producing 10,000 to 50,000 tons a year, are most regular in their operations; and that big companies, producing 50,000 tons or more a year, are most sensitive to booms and depressions, hence show wide fluctuations in their operating rates. A natural conclusion is that once an efficient size is reached, mere bigness does not pay.

Consolidations of competing companies have been common, yet the ratio of plants to companies has declined, indicating that after such horizontal consolidations many plants have been closed. Although total kiln capacity has increased, the number of active kilns has decreased greatly. No data are available to show which plants may be obsolescent, but the industry has been plagued by overcapacity. From 1917 to 1938, output averaged only 51 per cent. of the approximate capacity of even the active companies.



The Portland-cement industry in July, 1939, produced 12,644,000 barrels, shipped 11,755,000 barrels from the mills, and had in stock at the end of the month 22,366,000 barrels, according to the Bureau of Mines. Production and shipments showed increases of 15.2 and 16.1 per cent., respectively, as compared with July, 1938. Stocks at mills were 4.1 per cent. lower than a year ago. The mill value of the shipments—54,268,000 barrels—in the first half of 1939, is estimated as $79,088,000. Shipments totals for the first six months include approximately 1,920,000 barrels of high-early-strength Portland cement with an estimated mill value of $3,829,000.

Lath Sales to Front in Gypsum Industry

The high volume of sales of gypsum lath so far this year has been the most striking feature of the industry. Reports by producers to the Bureau of Mines for the second quarter of 1939 show an increase in sales of this product of nearly 50 per cent. over sales during the similar period of 1938. As there was a similar gain during the first quarter of the year, total sales of lath for the January-June period of 1939 were nearly 1½ times as great as during the corresponding period in 1938.

A gain of 50 per cent. in sales of all gypsum tiles and blocks in the second quarter of this year over those in the similar period of 1938 is also of outstanding interest. Total sales of tiles in the January-June period of 1939 were more than one-third higher than in the corresponding period of 1938.

Consumption of uncalcined and calcined gypsum products for both the second quarter and first half of 1939 increased in nearly all classifications over that of the corresponding periods of 1938.

EMPLOYMENT AND PAY-ROLLS

(Compiled for PIT AND QUARRY by Isador Lubin, Commissioner of Labor Statistics, U. S. Dept. of Labor.)

Industry	Establishments	Number of Employees	Pay Rolls (1 week)
Cement:			
June, 1939	136	21,345	$582,043
July, 1939	136	21,600	579,799
Percentage change		+1.2	−0.4
Quarrying and nonmetallic mining:			
June, 1939	960	34,347	762,921
July, 1939	960	34,463	746,541
Percentage change		+0.3	−2.1

Kosmos Cement Plant Goes "On the Air"

The Kosmosdale, Kentucky plant of the Kosmos Portland Cement Company was "on the air" one day recently over Station WHAS, Louisville.

Portable microphones were taken into the various departments and the noises of the mills and machinery formed the background for short talks on the operating functions of the different departments. A. C. Brown, superintendent, T. W. Kraft, mechanical engineer, and E. E. Berger, chief chemist, all participated in the conversation during the trip through the mill which described the cement-making process from start to finish.

The broadcast was one of a series sponsored by the University of Kentucky, called "Visiting Kentucky Industries."

When finished, this huge welded assembly will serve as a boom for a 1¼-cubic yard crawler crane. This boom is made by welding rolled steel sections (flame-cut from plate). It is about 30 per cent. lighter in weight than the riveted design previously used. The welding is being witnessed by Eugene A. Balsley, chairman, Chicago Section, American Welding Society, and Harry G. Boardman, national president of the society. Welding engineers and production executives of metal-fabricating plants from all over the country will assemble in Chicago during the week of October 23-27 to attend the annual meeting of the American Welding Society. (Photo courtesy of Link-Belt Company)

EDITORIAL

The Burden of Distribution Costs

FOR years consumers have complained about the high costs of distribution of the products they buy. They have found in some cases that the price they were forced to pay was as much as six and seven times the cost to produce the article purchased. Perishable goods, like farm products, have shown some of the largest spreads between the costs of production and retail prices. In some of these cases the difference has been accounted for principally by transportation charges where the point of sale was far from the point of production. In others the major portion of the spread is taken by the manufacturer, as in the case of cigarettes; in still others the retailer takes the largest share, as in the case of electric refrigerators, radios, and the like. There are very few products in whose retail price the costs of distribution—the charges of getting them from the points of production to the points of consumption—do not represent a very large share of the costs to the consumer.

Although it has only been in recent years that much evidence concerning this spread between production costs and selling prices has been made available to the general public, agitation for the elimination of the "middle man," who has always loomed large in the public's appraisal of the distribution problem, has been going on for years. On the basis of a bare comparison of production costs and retail prices, without any knowledge of the functions and operating costs of the factors between the tasks of production and retailing, it has always seemed that somewhere along the line someone was taking inordinately large profits that were disproportionate to the service rendered. The "middle man," a heretofore somewhat shadowy and little understood individual, has been commonly regarded as the hidden pirate. Merely from the fact that such conclusions were founded on supposition rather than knowledge it is reasonable to believe that they have been as unjust as they have been superficial.

The importance of the factors who in different degrees are responsible for getting the products of farms and factories to buyers of all kinds has only recently been given serious study. One of the latest examinations of the problem is a work entitled *Does Distribution Cost Too Much?,* issued by the Twentieth Century Fund. The data and the conclusions contained in it are the results of a survey of the changing *rôle* of distribution in the American economic system recently made by a committee appointed by the trustees of the Fund.

Based on factual evidence covering numerous types of commodities, it has been estimated that America's total annual expenditures for finished goods of all kinds amounts to approximately 65.6 billion dollars. The selling and buying transactions involved in bringing these goods from the points of production to the points of their use total more than three times as much, or 218.6 billions. Of this 65.6 billion dollars spent by final or "terminal" buyers, 87 per cent., or 56.9 billions, represent values added by the various intermediate agencies engaged in growing, buying, storing, manufacturing and selling, while the remaining 13 per cent., or 8.7 billion dollars, represents the cost of transportation.

The increment added by agriculture, the difference between sales of 12.4 billion dollars and purchases of 5.3 billions, was 7.1 billion dollars. The extractive industries added 3.7 billions, the difference between purchases of 1.2 billions and sales of 4.9 billions. Manufacturers added 22.4 billions, raising the value of their purchases from 47.2 billions to sales of 69.6 billions. The wholesale distributive mechanism of the economic system sold for 69.3 billion dollars goods for which it paid 62.2 billions, adding 7.1 billions in the process. Retail trade took a toll of 12.2 billion dollars, the difference between its purchases of 37.0 billions and its sales of 49.2 billions. It is in the last two steps of the economic sequence, wholesaling and retailing, that most consumers have found their cause for complaints. These two functions added 19.3 billion dollars to the cost of the materials which they bought, or nearly 30 per cent. of the prices paid by "terminal" buyers.

DISTRIBUTIVE functions that take such a large part of the buyer's dollar naturally will bear some study, because of their effects on the standard of living and on the profitable conduct of productive industry. It would seem that the costs of getting the products of farms, mines and factories to the ultimate consumer are disproportionately large. If this supposition were justified by the facts as they are known, then it would appear either that the intermediaries are charging more than they should for the service they perform, or that the number of intermediaries in competition with each other is too large, or that some of the services they perform (and, consequently, some of those who perform them) are economically unnecessary.

In the sale of some types of goods the portion of the final selling price which goes to the retailer is high. Thus, refrigerators which in 1935 cost, on the average, $58 to manufacture were sold to the ultimate buyer at $156. Of the $98 spread, $12 went to the manufac-

turer for selling and administrative expense and profit, $16 to the wholesaler, and $70 to the retailer. Of the retail price of a $4 pair of shoes, the manufacturer's production cost was $2.08, his price to the jobber was $2.16, the price to the retailer was $2.60, giving the jobber a margin of 44 cents and the retailer a margin of $1.40. Gasoline that was sold in New York for 12½ cents a gallon exclusive of tax cost the dealer 8½ cents and the jobber 6½ cents. The average consumer, made aware of these spreads, wonders why the retailer in some lines, such as the case of refrigerators, must get such a wide margin within which to meet expenses and realize a reasonable profit, and, further, why in any of these cases (as well as others) there should be a jobber.

THE great expansion of mail-order houses has indicated to some extent how the functions of retailer can be combined with those of jobber with respect to some classes of goods, although in recent years it has been found advisable to augment direct selling with store outlets. In other ways the ability of the manufacturer or jobber of consumer goods to act as outlet to the consumer has been demonstrated. The fields in which more direct distribution could be effectively and economically adopted have not as yet been fully explored, although of late the functions of the intermediary have been taken over more and more by manufacturers and retailers and, to a growing extent, by consumers. In the six-year period from 1929 to 1935 the independent wholesaler's share of intermediary trade decreased from 36.8 per cent. to 32.2 per cent. Less than half of the costs of wholesaling is made up of the costs of breaking bulk, storing and delivering, while most of the remainder is accounted for by selling and credit costs. The fact that intermediary trade as a whole in 1935 showed average costs of 9.5 per cent. of sales as compared with 13.2 per cent. in the case of "wholesale merchants" shows that other agencies are performing the functions of wholesaling more economically or are restricting their services to essential functions.

The authors of the Twentieth Century Fund's report answer the question asked by the book's title in the affirmative. Among the costly and common conditions revealed by their study are: the multiplicity of sales outlets, which reduces the ratio of profit to investment by greatly increasing the share of total operating expenses borne by each unit sale; duplication of sales efforts, as shown by the number of competitive salesmen working on the same "prospects"; excessive services that have no bearing on the quality, performance or consumer satisfaction of the goods sold; multitudes of brands, necessitating larger inventories and larger quarters for a given volume of business; and unnecessary advertising—all occasioned by the pressure of competition. Consumers themselves are partly responsible for the high costs because of their lack of information useful in buying and their unreasonable demands. Distributors' costs are too high because of an inadequate understanding of their true costs, overemphasis on the advantages of volume, bad price policies, lack of planning, and poor management.

We share with the authors the belief that much of the remedy is within the power of consumers. By acquiring a better knowledge of what they want to buy they can greatly reduce the number of competitive brands of practically identical goods on the market and they can reduce the amount of money that is spent in competitive advertising and selling by the makers of those goods. A more widespread knowledge of the costs of installment buying, which frequently amount to as much as from 12 to 18 per cent. on their investment, would lead to wiser planning. They can buy direct at considerable savings many of the things they purchase from neighborhood stores.

The consumer can not alone, however, accomplish all that should be done in reducing the costs of distribution. Government agencies that provide consumer buying information can and should increase their activities and services. There should be further progress in the efforts being made to eliminate misrepresentation and fraud in advertising and in the verbal descriptions of products on the radio and in person-to-person selling. The labels on many products can be improved to give buyers more precise knowledge of what packages contain. Retailers could readjust their system of pricing so that each item sold would carry as a part of its price the share of operating expenses properly chargeable to it. By fixing a separate charge for luxury services, now considered as an inescapable part of retailing, many of them could be eliminated or so reduced as materially to affect prices. Consumer coöperatives provide agencies through which consumers can obtain better pricing and lower costs on the goods they buy.

THE extractive industries, of which the nonmetallic-mineral industries constitute a branch, are not greatly concerned with the problems of distribution as they affect the sale of consumer goods except with respect to such of their products as are sold through dealers and distributors. Yet the high costs of distributing goods of all kinds do to a large extent determine the amount of money that is available for capital investments. House-building, which is of great interest to our industries, is dependent on the extent to which consumers can save, and that can not be greatly increased unless there is a wider margin between gross individual income and the cost of living. Purchasing power can be increased by raising wages and salaries or by lowering prices. Simplified and improved distributive methods offer a large field for lowering prices of most types of consumer goods and thus widening the buying capacity of those who in the last analysis provide the economic motive power that keeps factories busy.

By W. E. TRAUFFER

Froth Flotation Economically Recovers Valuable Material from Talc Waste

A view of the plant from hill with flotation department at right.

THE Eastern Magnesia Talc Company of Burlington, Vermont, has been one of the leading producers of talc in its various forms since its formation in 1923. It has developed many of the methods and practices now common to this industry. Most important is the development at its Johnson, Vermont, plant of froth-flotation methods, which make possible the recovery of talc formerly wasted because of the difficulty of removing magnesite, nickel, cobalt and other impurities. Froth flotation now makes possible the economical recovery of 95 per cent. pure talc from the dry-plant waste, which consists of about 55 per cent. talc, 35 per cent. magnesite, and 10 per cent. other impurities.

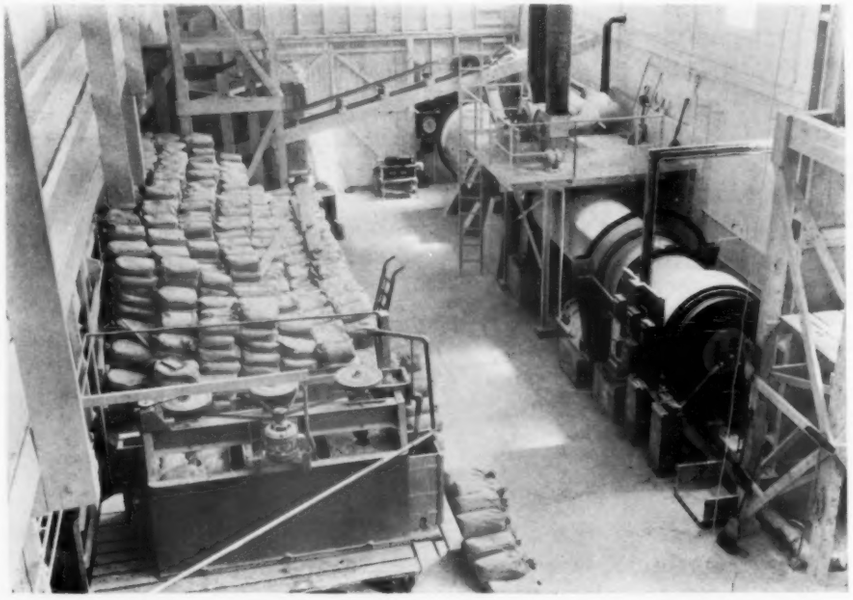
The froth-flotation plant makes possible the production of any desired grade of talc from 50 to 98 per cent. pure. The capacity varies with the degree of purity. At present the feed to this plant is 1.2 tons per hour of material containing 55 per cent. talc. About 93 per cent. of this talc is being recovered. About 150 pounds of nickel concentrates are also being recovered daily and these find a ready market. It is expected that a market will eventually be found for the high-iron magnesite (breunnerite) which is now being wasted. No economical method for removing the iron has yet been discovered. A complete testing laboratory makes possible close control over all operations and experiments are being conducted to improve the methods and to find new outlets for the products.

Experiments with froth flotation were begun in 1934, when the waste-pile from the dry plant had grown to 10,000 tons. In coöperation with the U. S. Bureau of Mines, a reclamation process was developed. A pilot plant was built in 1936 and a new plant in 1937 with a wet table and conditioner, 8 froth-flotation cells, a thickener and a drum filter. Late in 1937 the building was enlarged and early in 1938 another table and 3 additional cells were installed, doubling the capacity of the plant. A rotary drier was added later. This plant is now reprocessing both the accumulated and current wastes at the rate of 30 tons per day.

The dry plant has also undergone many improvements since last described in the December 3, 1930 issue of PIT AND QUARRY. The ore from the mine is dumped into a jaw crusher followed by a rotary crusher. Two trommels and another rotary crusher are used to reduce the ore further. A Hardinge

Combustion chamber of the drier showing the oil burner.

Ruggles-Coles rotary drier removes the moisture from the fine material during wet seasons. All this material goes into storage tanks from which it is fed to a buhrstone mill and a Hardinge conical mill. The mill product goes to a separator from which the tailings go to the

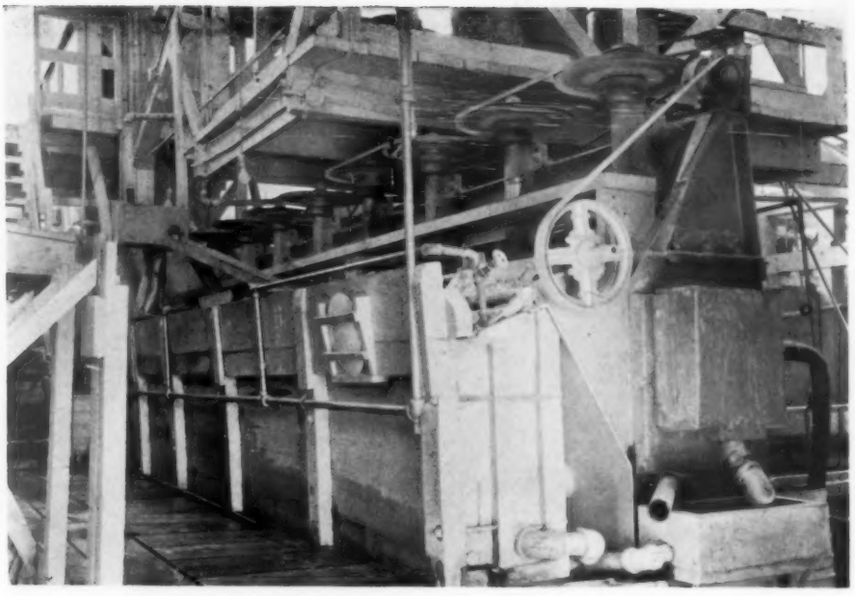


Looking down on feed conveyor to drier and suction line from it. Three-cell machine at the left.

flotation plant. The Hardinge mill is equipped with a Hardinge electric-ear feed control.

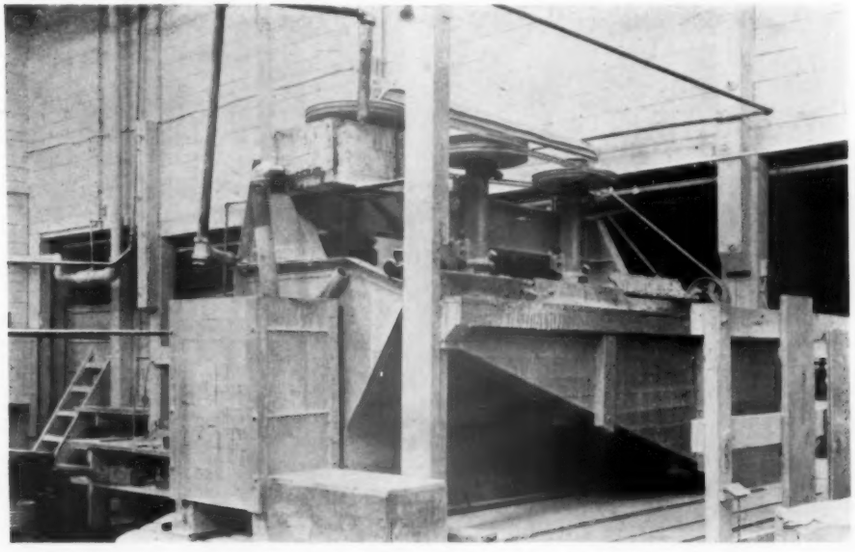
The material for flotation is fed from the dry processing plant by a screw-

Vertical centrifugal pump handling table middlings.



Eight-cell flotation machine used for final reclamation of talc from gangue.

feeder into a conical storage tank in the flotation plant. A Syntron feeder discharges this material at the desired rate into a Denver mechanically-agitated conditioning tank where reagents and water are added. This mixture is then fed to a Denver-Wilfley No. 6 concentrating table and a Deister Plat-O table operating either in parallel or in series in the order mentioned depending on the grade of product or the by-products desired. The concentrate from these tables is mainly a nickel product containing from 18 to 24 per cent. nickel. These concentrates are sold.

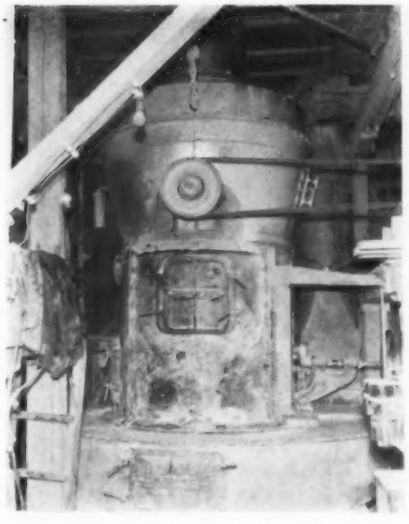


Three-cell flotation machine which receives product of the concentrating tables.

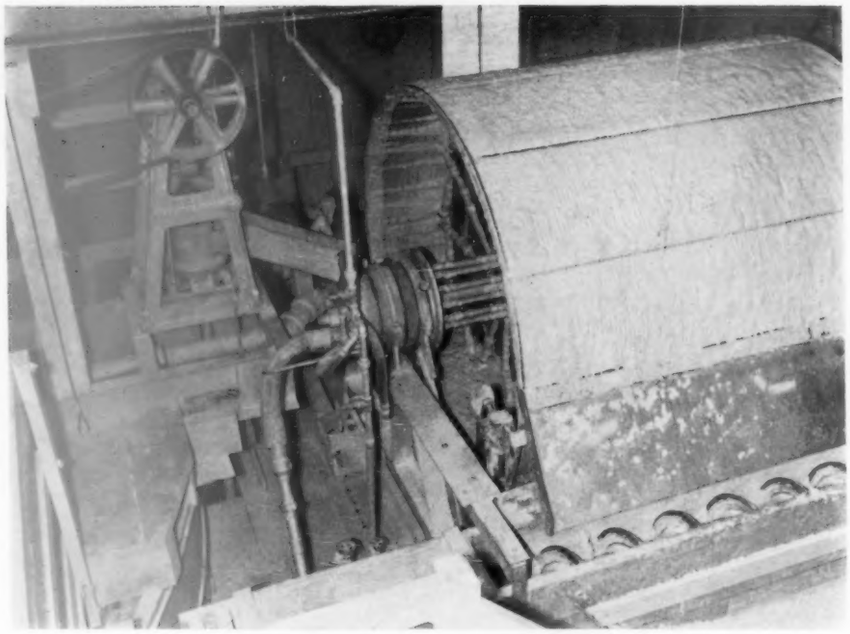
The middlings from these tables contain 80 per cent. magnesite, 15 per cent. talc and 5 per cent. nickel. A Denver vertical centrifugal sand pump feeds this material to a James concentrating table, the product of which is almost the same as that of the preceding tables, containing from 18 to 22 per cent. nickel and about 2 per cent. cobalt. This material is also sold. The magnesite tailing from this table is now wasted but means for making it salable are being developed.

The tailing from the first two tables, consisting chiefly of talc and magnesite, is pumped to a Denver Equipment Co. 28-inch by 33-inch 3-cell Denver "Sub-A" (Fahrenwald) flotation machine. The flotation concentrate, containing 95 per cent. talc, is pumped to a thickener. The tailing goes to an 8-cell 22-inch by 27-inch Denver "Sub-A" (Fahrenwald) flotation machine. The tailings from both machines contain nearly 90 per cent. magnesite and the remainder is talc. These tailings are being wasted but form only a small percentage of the material processed.

The concentrate from the flotation machines is transferred by a 2-inch Wilfley pump to the 18-foot diameter by 12-foot Denver thickener. In this thickener the moisture content of 80 to 82 per cent. is reduced to about 50 per cent. A Denver adjustable-stroke diaphragm pump transfers the product of the thickener into a 6-foot by 6-foot Denver rotary-drum filter which further reduces the moisture to between 20 and 25 per cent. A screw-conveyor drops the filter cake at the rate of 1 ton per hour on a belt-conveyor to the 4-foot by 25-foot Ruggles-Coles Class A indirect-heat rotary drier. This drier is equipped with a new type of stationary combustion chamber and a Hauck oil-burner. A Leeds & Northrup Rayotube at the discharge end of the drier



Mill and integral separator used for fine grinding of the dried product.



Rotary-drum filter which is fed from thickener by the diaphragm pump at left.

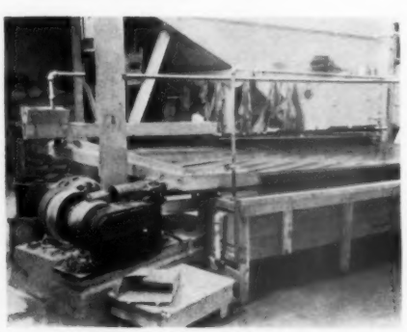
picks up the temperatures of the exit gases which are recorded and indicated on a Leeds-Northrup Micromax meter. This system automatically increases or decreases the amount of oil fed to the burner to maintain the desired temperature. The Rayotube is said to be much more sensitive than ordinary pyrometers and operates with only a few seconds lag. An exit-gas temperature of 690 to 695 degrees F. is being maintained, resulting in a product containing 1/10 of 1 per cent. moisture and with a temperature of 300 degrees F.

The drier is equipped with two fans, one to circulate the hot gases and the other to furnish the draft and remove the vapor in the drier. The drier is driven through a ring gear by a 15-horsepower General Electric motor and a Falk speed-reducer.

The finished product of the drier is talc with a fineness of 90 per cent. through 200-mesh. A screw-conveyor feeds this material to a bucket-elevator from which it is discharged into a storage tank. This material can be passed through an International Pulverizing Company Micronizer for making a 4- to 5-micron product. This machine has a capacity of 1,000 pounds per hour. Usually, however, the dried talc is discharged to a pipe-line through which an American Air Filter Company Roto-clone draws it into a storage tank over a Raymond 5-roll high-side mill with a double Whizzer in the dry plant. The final grinding is done in this mill, which produces material as fine as 99.9 per cent. through 325-mesh. The products of this mill are used in the manufacture of paper, textiles, etc.

The Eastern Magnesia Talc Company was formed in 1923 by the consolidation of the Eastern Talc Company with plants at Rochester and East Granville, Vermont; the Magnesia Talc Company, Waterbury, Vermont; and the American Mineral Company, Johnson, Vermont. After the severe flood in 1927 the Rochester plant was abandoned and most of the equipment moved to Johnson and Waterbury. The East Granville plant was abandoned shortly after the consolidation.

The two primary concentrating tables with the conditioner visible above.



Concentrating table which reclaims nickel concentrates from primary-table middlings.

Emery Mined Only in Three Eastern Areas

Emery is known to occur at a number of places in the eastern United States, but has been mined only from Chester, Massachusetts, Peekskill district, New York, and Whittles, Virginia.

Emery was discovered in Hampden County, at South Mountain, Massachusetts, near Chester, in 1864 by Dr. H. S. Lucas, although 30 years previously the deposit had been unsuccessfully worked as an iron mine. Previous to 1913, practically all the emery from the United States was produced from this locality. The deposits are associated with a narrow band of amphibolite that extend almost continuously across the state. In the vicinity of Chester this band is about ¾ mi. wide, and the emery deposits can be traced for about 5 mi. The deposits occur in the form of a vein in the eastern side of the band, in close proximity to sericite schist. The emery is found in pockets from a few feet to 12 ft. wide and has been mined in places to a depth of 300 ft. Six or seven mines were operated along this vein and large quantities of ore were extracted, but the workings have been abandoned since 1913.

A spinal emery occurs to the west and south of Whittles (Pittsylvania County), Virginia. Although the deposits were exploited many years ago from iron ore, they were not successfully worked for an abrasive until 1917 and for the next 11 years yielded a large quantity of good material.

The method of mining was based on the strongly developed joint structure of the emery bodies. After the decomposed rocks were removed, the emery blocks were dislodged by forcing iron bars into the joints. Very little dynamite was used.

Emery deposits of the spinel variety occur east of Peekskill (Westchester County), New York, and have been operated by various companies since 1883. The ore occurs on the border of an igneous complex composed of hornblende and olivine pyroxenite termed the "Courtland" series. The emery occurs in a region in which mica-schist inclusions are abundant, and is in sharply defined veins immediately associated with rock containing sillimanite, cordierite, garnet and quartz. A characteristic of these schist inclusions is the great abundance of biotite found around the ore in many places. The two chief mines are the Dalton and McCoy. They are worked by open-cut methods, some pits being over 80 ft. deep. In recent years production has been maintained by two operators, the Smith & Ellis Company, and the Keystone Emery Mills.

The Lubrication of Equipment

IV. Crushers

By JAMES I. CLOWER
Associate Professor of Machine Design
Virginia Polytechnic Institute

CRUSHERS are massive, heavy-duty machines employed to break or crush relatively large pieces of various materials, such as rock, coal, gypsum, and ores into smaller sizes. They are widely used in quarries, sand-and-gravel pits, in lime, gypsum, and metal-reduction plants, and tile, brick and other clay-product factories.

In general there are four distinctive types of crushers used: (1) jaw, (2) roll, (3) swing-hammer, and (4) gyratory.

Where hand loading is used, the material is usually quarried to such a size that its reduction can be accomplished by one of these machines in a single operation. Where power shovels are used for loading, however, the material is usually too coarse to be reduced to finished size by a single operation by one machine. Thus, two distinctive and separate operations are used in this case—*primary crushing* and *secondary crushing*. In the first stage jaw, single-roll, large gyratory or hammer crushers are used to reduce and prepare the coarse material for the second stage. Small gyratories, swing-hammer or double-roll crushers are used in the second stage to complete the reduction.

Crushers are no exception to other pit-and-quary machinery in that they are subjected to severe operating conditions. Bearing loads are usually of the intermittent and shock variety, generally high and sometimes excessive. Exposure to dust, grit, rough treatment, and water is the rule rather than the exception. All too frequently production is demanded even at the expense of excessive wear and tear.

The importance of correct lubrication as a major factor in reducing maintenance and operating expenses is not appreciated fully in many operations. Continuous production and efficient production obviously depend respectively on reliable and efficient operation, both which are dependent largely on correct lubrication.

Correct lubrication involves both the selection of the correct lubricant for the service in question and its proper application. Regardless of the quality of the lubricants used, if they are not applied in the correct amounts and at the proper points, excessive wear, overheating, "seized" journals, belt trouble, stripped gears, and other equally costly events are likely to occur.

Specifically, correct lubrication tends to reduce wear, repair costs, power consumption, lubrication costs, depreciation, and to increase production. It it of major importance in the practical every-day operation of crushers.

Principles of Operation

Jaw Crusher.—The principle of the lever is employed in the jaw crusher, as in Figure 1. Two common constructions are used, each comprising essentially a rigid crushing face, a hinged jaw, and a rotating eccentric and shaft that operates the jaw.

In the Blake design the jaw swings from the top. The eccentric motion is usually transmitted by a pitman to toggles that act upon the jaw and exert tremendous force on the material crushed. In a variation of this design the toggles are dispensed with and the eccentric acts directly on the jaw. In another direct-acting design, known as the roll-jaw, the eccentric shaft serves also as a rocker shaft and actuates the jaw at its top.

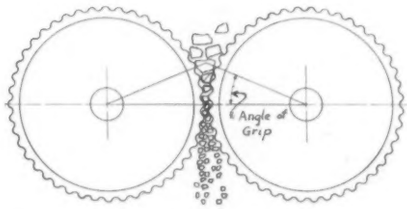


Fig. 2. Sketch showing principle of the roll-crusher.

Roll-Crusher. — Fundamentally, the principle of the wedge is used in the roll-type crusher, as in Figure 2. The material is crushed when it is drawn by the roll or rolls into a wedge-shaped throat and is forced between the crushing surfaces.

The roll-crusher is a secondary crusher and is adapted to the economical production of small material in large quantities. Two types of rolls are employed; namely, smooth surface and corrugated surface. Smooth-surface rolls are limited as to the maximum size of the feed material that

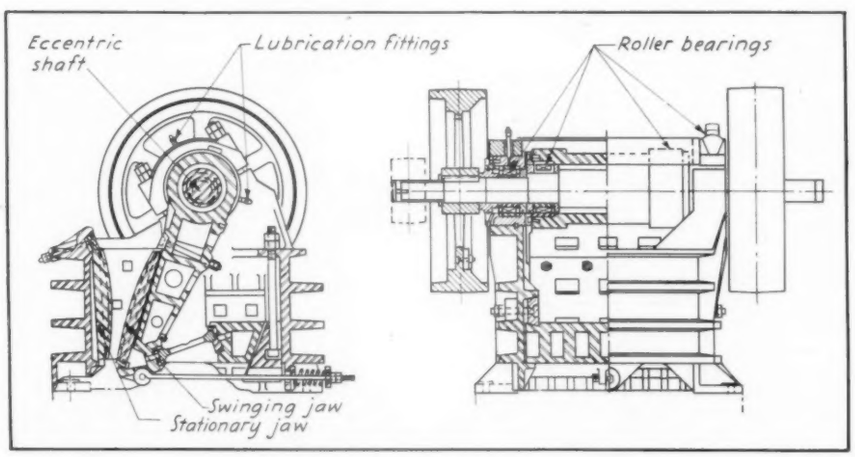


Figure 1. Oil-lubricated roller-bearing jaw crusher.

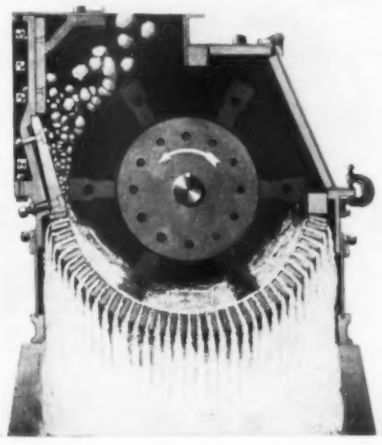


Figure 3. Swing-hammer crusher showing principle of reduction.

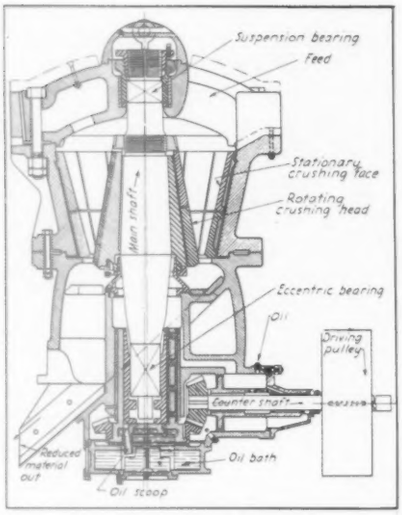


Figure 4. Section of gyratory crusher showing parts that receive lubrication.

they will handle, while corrugated-surface rolls are limited as to the minimum size of material that they will produce.

Swing-Hammer Crusher.—The swing-hammer crusher (Figure 3) accomplishes crushing by the impact of swinging hammers against the material while in suspension. The material is fed into the machine at the top and falls into the path of the rapidly revolving hammers. Compared with other types it is a high-speed crusher, operating at 1,200 and more r.p.m. It comprises essentially a rotor to which are pinned the swinging hammers, an adjustable breaker plate, and a cage or screen bars.

Gyratory Crusher.—In the gyratory type of crusher the material is reduced by the conical rolling action of a crushing head, actuated through gears and a belt or a built-in electric motor that drives direct. The crushing head, mounted on a large, vertical shaft that revolves eccentrically with respect to the crushing face, successively approaches and recedes from the stationary crushing surface, as in Figure 4. This attrition action results in a continuous breaking of the material which subsequently falls through at that point of the throat from which the head is most distant.

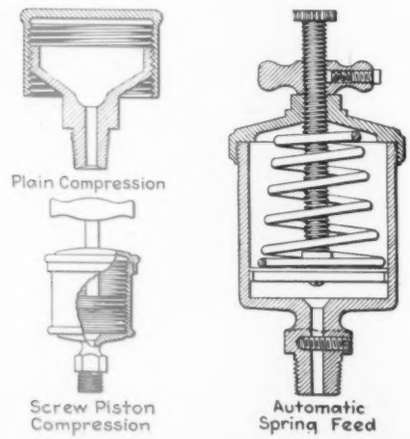


Figure 5. Some types of grease cups.

TABLE I—GUIDE TO SELECTION OF OIL FOR CRUSHERS

An oil of the following characteristics will generally be suitable for the following crushers under average operating conditions.

Characteristics of Oil A

Viscosity, Saybolt universal seconds at 100 degrees F. 320
130 degrees F. 143
210 degrees F. 55

Flash point, 390 degrees F. Pour point, 0 degrees F.
Fire point, 445 degrees F. Specific gravity, 0.905

Parts	Method of Application	Type of Crusher	Make
Eccentric bearing Lower guide bearing Step bearing Suspension bearing	Forced circulation Forced circulation Forced circulation Oil-saturated elastic wool yarn	Gyratory	Allis-Chalmers Newhouse
Eccentric bearing Spherical seat Lower guide bearing Step bearing Bevel gears Countershaft bearings	Forced circulation Forced circulation Forced circulation Forced circulation Forced circulation Forced circulation	Gyratory	Symons Cone
Eccentric bearing Step bearings Bevel gears Countershaft bearings	Forced circulation Forced circulation Forced circulation Forced circulation	Gyratory	Telsmith

Parts Requiring Lubrication

Because of the heavy, grueling work that crushers do, they are built with as few parts as it possible. The number of parts that require lubrication is therefore correspondingly few.

The parts of jaw crushers that require lubrication are the main eccentric-shaft bearings, which may be either of the ball, roller or sleeve type, pitman bearings, and jaw-shaft bearings.

The parts of roll-crushers that require lubrication are the roll-shaft bearings and gears.

The only parts of swing-hammer crushers that require lubrication are the main rotor-shaft bearings.

The major parts of gyratory crushers that require lubrication are the eccentric bearings, step or suspension bearing, guide bearings, gears and counter-shaft bearings, of some designs.

Methods of Lubrication

Jaw Crushers.—The majority of pitman bearings, main bearings and jaw-shaft bearings of jaw crushers are lubricated by grease, applied by grease cups (Figure 5), grease guns (Figure 6), or integrally cast grease wells. In the paste wool-waste or wool-yarn greases were used in grease wells, but present practice is to employ block greases without yarn or waste. A soft-consistency (Number 2 or Number 3) grease is used where it is necessary to supply the bearings through long pipes by a pressure system.

Where oil lubrication is used, the bearings may have oil wells packed

TABLE II—GUIDE TO SELECTION OF OILS FOR CRUSHERS

An oil of the following characteristics will generally be suitable for the following crushers under average operating conditions.

Characteristics of Oil B

Viscosity, Saybolt seconds at 100 degrees F. 660
130 degrees F. 270
100 degrees F. 66

Flash point, 425 degrees F. Pour point, 0 degrees F.
Fire point, 480 degrees F. Specific gravity, 0.910

Parts	Method of Application	Type of Crusher	Make
Eccentric, lower guide, steps, and bevel gears Upper guide or suspension Countershaft bearings	Bath Oil-saturated elastic wool yarn Chain oilers	Gyratory	Allis-Chalmers Gates D
Eccentric, lower guide, step, bevel gears, countershaft bearings Suspension bearing	Forced circulation Oil-saturated elastic wool yarn	Gyratory	Allis-Chalmers Gates N
Eccentric, lower guide, steps, and bevel gears Suspension bearing Countershaft bearings	Forced circulation Oil-saturated elastic wool yarn Ring oilers	Gyratory	Allis-Chalmers Superior McCully
Eccentric, lower guide, step, bevel gears, countershaft bearings Suspension bearing	Splash Oil-saturated elastic wool yarn	Gyratory	Austin 100 Type
Eccentric, lower guide spherical seat, ball step, rotor bearing Suspension bearing	Forced circulation Oil-saturated elastic wool yarn	Gyratory	Kennedy-Van Saun Gearless

TABLE III—GUIDE TO SELECTION OF OILS FOR CRUSHERS

Parts	Methods of Application	Type of Crusher	Characteristics of Oils
Bearings	Oil-saturated wool yarn, oil boxes, ring oilers, drop-feed oilers, and mechanical forced-feed lubricators	Jaw and roll	Dark lubricating oil having a Saybolt Universal viscosity of about 1,800 sec. at 100 deg. F., a flash point of 380 deg. F., and a pour point of 25 deg. F. or less. It should be a pure residual oil and should not contain any fillers, such as rosin, talc, wax, clay, mica, graphite, etc.
All plain bearings and roller bearings that operate over 500 r.p.m.	Ring oilers, bath and circulation oiling	Swing-hammer	A pure mineral oil having a Saybolt Universal viscosity of about 660 sec. at 100 deg. F. and 66 sec. at 210 deg. F., a flash point of 420 deg. F., and a pour point of not more 25 deg. F. This should be a high-quality, filtered neutral oil.
Bearings	Circulation oiling	Jaw	A highly refined, pure mineral oil having a Saybolt Universal viscosity of about 1,500 sec. at 100 deg. F. and 120 sec. at 210 deg. F., a flash point of 500 deg. F. and a pour point of 40 deg. F. or less. This should be a high-quality, filtered neutral oil.
Roller bearings under 500 r.p.m.	Bath oiling	Jaw and swing-hammer	Steam-cylinder oil having a Saybolt Universal viscosity of about 140 sec. at 210 deg. F. and containing about 5 per cent. acidless tallow compound. It should have a flash point of 540 deg. F. and a pour point of 40 deg. F. or lower.

TABLE IV—GUIDE TO SELECTION OF GREASES FOR CRUSHERS

(For all makes and types)

Parts	Methods of Application	Characteristics of Greases
Plain bearings of gyratory crushers	Compression grease cups	Lime-base cup grease of medium consistency (No. 3), containing from 75 to 85 per cent. mineral oil having a viscosity of about 125 S.U.S. at 130 deg. F.
Plain bearings of jaw and roll crushers	Screw-down grease cups	Soda-base grease of medium consistency (No. 3), containing from 75 to 85 per cent. mineral oil having a viscosity of about 125 S.U.S. at 130 deg. F.
Roller, ball and plain bearings	Grease packed and grease gun and pressure greasing systems	Soda-base grease of soft consistency (No. 2) or of very soft consistency (No. 1), containing from 85 to 95 per cent. mineral oil having a viscosity of about 550 S.U.S. at 130 deg. F.
Plain bearings	Grease wells	Soda-base grease of very hard consistency (Nos. 5 or 6), containing about 45 per cent. soap and 55 per cent. residual oil having a viscosity of more than 100 S.U.S. at 210 deg. F.
Gears	Hand, brush or paddle	Heavy, tacky gear grease possessing strong adhesive characteristics so that it will not be thrown off by centrifugal force. It should also not "ball-up" with dust, flake off or dry.

with elastic wool yarn, mechanical force-feed lubricator, ring oilers, or oil bath, depending on the make and size of machine.

Roll-Crushers. — Bearings of large roll-crushers are lubricated generally by grease, applied by means of a centralized greasing system, by individual compression grease cups, or by screw-down grease cups. Some makes are provided with oil wells which are packed with elastic wool yarn; others have intregally cast wick-feed oil boxes; others are equipped with drop sight-feed oil cups; and still others have bath-oiled roller or ball bearings. The timing gears are generally open and are swabbed with grease or heavy oil, using a brush or paddle.

Swing-Hammer Crushers.—The bearings of this type of crusher are lubricated either by oil or grease. Oil is more generally used. Both sleeve and anti-friction bearings are in extensive use. Ring and circulation oiling are employed for plain sleeve bearings, while the anti-friction bearings may be bath-oiled, grease-packed, circulation-oiled. The mill shown in Figure 7 has ball bearings, equipped with screw-down grease cups.

Gyratory Crushers.—Gyratory crushers are generally fitted with a circulation oiling system, as in Figure 8. Some designs, however, are bath-oiled, as in Figure 4, while others are splash-oiled. The upper suspension bearing is generally independently oiled by means of oil-saturated wool yarn.

The system shown in Figure 8 comprises a built-in pump, gear-driven from the countershaft, a suitable external oil reservoir (not shown), and the necessary piping and fittings. Oil

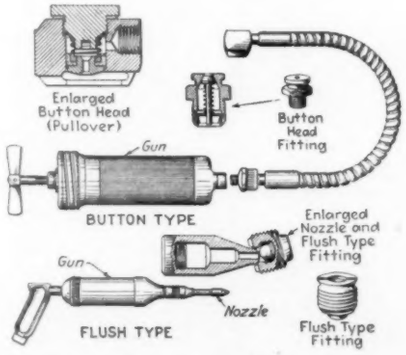


Figure 6. A few types of hand grease guns and accessories.

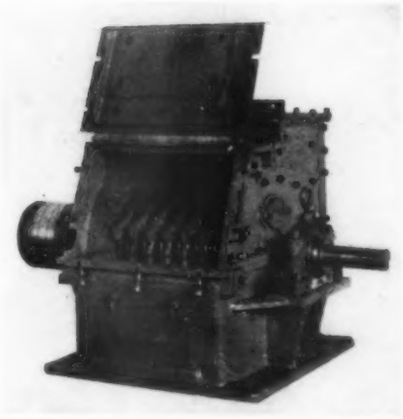


Figure 7. Swing-hammer crusher equipped with grease-lubricated ball-bearings.

is drawn by the pump from the reservoir and forced upward through the eccentric bearing, lubricating both the inner and outer surfaces. It is also forced through a vertical drilled hole in the shaft to the spherical-seated thrust bearing that supports the cone crushing head. Overflow from the thrust and eccentric lubricates the gears and countershaft bearings. The thrust bearing at the bottom end of the shaft runs submerged.

Characteristics of Lubricants

It is obviously impracticable to prepare lubrication-recommendation tables for crushers sufficiently comprehensive to include all makes, types and operating conditions. Tables I, II, III, and IV are based on actual service experiences and are offered only as reliable guides for normal operating conditions for machines that are in reasonably good mechanical condition. For abnormal operating conditions, such as extremely high or low temperatures, or for machines that are in poor mechanical condition it may be advisable to depart from these recommendations.

In departing from these recommendations it should be kept in mind that higher-than-normal temperatures point toward the use of more viscous oils, while lower temperatures require less viscous oils of lower point. In any case, the pour point should be at least as low as the lowest atmospheric temperature encountered.

Other things being equal, where circulation, splash, ring, and bath oiling methods are used, lower viscosity oils can be employed than where hand and drop-feed methods are used because:

(1) The former methods furnish a copious supply that maintains a lower bearing operating temperature; and

(2) The supply is constant and usually in excess of the requirements, whereas by the latter methods, because of the meager and intermittent supply, it is necessary that the oil "stay put" in the bearing for a considerable period.

(Continued on page 37)

By W. E. TRAUFFER

ADOPTS NEW SYSTEM OF QUARRY HAULAGE

View of the 10-per cent. incline from south showing two trucks starting up grade. Each unit is pulled by a separate hoist.

Steam shovel at Tomkins Cove quarry loading a trailer. Its performance prompted the firm to acquire two more steam shovels.

A view of the tractor-trailer fleet.

IN the last decade operators of non-metallic-minerals producing plants have concentrated their efforts upon methods of lowering their production costs and at the same time improving operating efficiency. Such efforts were made necessary by the low level of business and the low prices prevailing during the depression years. Now, with business at a much higher level and definitely on the upgrade, prices remain generally below pre-depression levels and the intense competition necessitates continued efforts along these lines.

Attention was first centered mainly on the processing plants but in the last few years digging and hauling methods have been put under the microscope. Many operators who have brought their plants to a point where no further improvement seems possible have found that additional large savings could be made in their quarries, pits or mines. This trend has been particularly noticeable in the replacement of old, worn-out haulage systems of various types with modern equipment better adapted to the existing conditions. A study of such changes made in plants in all parts of the country makes it clearly evident that no one type of haulage equipment is suited to all conditions and that each operator must make a study of his own conditions in order to select the type best suited to his needs. Loading equipment, such as shovels, cranes and draglines, has also come in for its share of attention.

One of the most interesting developments along this line was the recent change-over of four quarries of the New York Trap Rock Corporation to truck-trailer haulage, replacing three different methods formerly used. At the same time several new shovels were purchased to replace obsolete units. The addition of new drilling equipment has also contributed to the lower cost of production now being obtained at these plants.

Late in 1938 this company bought a few trucks and 2-wheeled trailers for one of its four active quarries. These proved so satisfactory that haulage equipment of various types at all the company's plants has now been replaced with this kind of equipment. A total of 29 of these trailers, all Easton-Phoenix Model TR-10, side-dump type, are now in use in the four quarries. While rated at 10-cubic yards capacity they are actually hauling much larger

pay loads. One side of each trailer is equipped with outrigger feet, which rest on a steel plate on the top of a concrete wall around the crusher. These feet relieve the tires of the shock load of dumping and reduce the strain on the trailer frame. Each trailer has two dual rear wheels with Timken roller bearings and axles made from 5½-inch Timken steel. Goodyear lug-type 11.75 by 24-inch pneumatic tires are used on the wheels.

All except a few of these trailers are hauled by Chevrolet tractor-type trucks. All are equipped with Truckstell Eaton 2-speed axles, as they carry the front ends of the 2-wheeled trailers. Five are Truckstell Thornton models with two rear driving axles. The others are equipped with single driving axles. Goodyear 6 by 32-inch lug-type tires are used on the front wheels. Goodyear 8.25-inch lug-type tires on 20-inch rims are used on the dual rear wheels which carry most of the load. On level ground this equipment can travel 25 miles per hour loaded.

According to Joe Q. Taylor, general superintendent for the company, this equipment has cut haulage costs at individual quarries as much as 75 per cent., with an average over-all saving of about 50 per cent. One hundred per cent. depreciation in two years was figured in making these estimates.

The first plant to be affected by this program was the one at Haverstraw, New York, where trucks and trailers replaced twelve old 5-cubic yard trucks in November, 1938. Seven TR-10 trailers are hauled by Ford and Chevrolet tractor-trucks.

New 9-inch well-drill at Haverstraw. Seven of these were recently placed in service.

The quarry face is now about ⅝ mile long and extends almost to the crusher building. Three shovels are used for loading and these are kept spread out along the face so that the average one-way haul is about ⅜ mile. The quarry floor has a very slight down-grade toward the crusher building. The contents of the trailers are dumped by means of an automatic cable dump mechanism into the 48 by 60-inch Traylor primary jaw crusher. These truck-trailer units average 4 miles to the gallon of gasoline compared to 1 mile per gallon for the old trucks and carry twice the pay-load.

The Haverstraw plants original capacity was 2,500 tons in 10 hours. The new haulage system and other improvements have increased the capacity to about 5,000 tons or 4,000 cubic yards in 8 hours. The quarry face ranges up to 180 feet in height. Because of space limitations another 80-foot level is now being opened and when the present level is worked out in about two years, it is expected to move the primary crusher down to that level.

This quarry is very difficult to "shoot" because of the vertical columnar formation of the trap rock and the restrictions on blasting. Only two well-drill holes are permitted to be "shot" at one time and not over 4,000 pounds of explosive can be used. The old 7-inch well drills used in this quarry were replaced late in 1938 by two Bucyrus Erie T29 9-inch electric well drills which have reduced drilling costs considerably. A new Ingersoll-Rand wagon drill was recently installed to "shoot" out the toes caused by these small shots.

"Barney" car in position to pull trailer.

Loading is done with two Bucyrus-Erie 100-B electric shovels with three ¾-cubic yard Bucyrus-Erie dippers and a Marion 37 electric shovel with a 1¾-cubic yard dipper. The three ¾-cubic yard buckets are of a new light-weight type and weigh less loaded than the 3-cubic yard buckets of standard design which they replaced with a consequent increase in the pay load handled. These buckets are made of all-welded, alloy steel.

The truck-trailers at the Tomkins Cove limestone plant went into operation March 13, 1938. Five 10-cubic yard Easton TR-10 trailers are hauled by five Chevrolet tractor-trucks. A sixth similar unit is kept in reserve. The five units have replaced three steam locomotives which hauled eight 8-cubic yard cars with from one to three skips mounted on each car. The haul from the quarry varies from ⅝ to 1 mile and is downgrade with a drop of about 30 feet. The trailers are dumped by means of a hoist and cable hook arrangement.

View showing incline, crusher platform and hoist house.

Loading was formerly done by two old Bucyrus 95 railroad-type steam shovels. These were replaced on March 13 with a used Bucyrus 120 crawler-type steam shovel. This has a new 4¾-cubic yard Bucyrus-Erie lightweight dipper. These improvements have considerably increased the capacity of this plant which is now about 2,750 cubic yards in 8 hours. Most of the screenings produced at this plant find a ready sale and some is also used to maintain the roads in the company's various quarries. The quarry face at this plant varies from 30 to 100 feet in height and as many as 5 or 6 holes are sometimes detonated at one time.

The Verplanck quarry was the last of these four to be affected by the new transportation program. The five truck-trailers used there went into operation August 11. They are also 10-cubic yard Easton TR-10 units hauled by Chevrolet tractor-trucks. They replace a remote-controlled electric-haulage system which had been used at this quarry for 15 years. According to Mr.

Taylor, this haulage system has been economical to operate and is being replaced only because the constant deepening of this quarry has made it too small for adequate track space. The old system included 10 self-propelled cars, of which 8 were used at one time. The quarry level now being worked has a 30-foot face and the floor is 150 feet below the level of the Hudson River, which is only 500 feet away. These cars had to climb a 10-degree incline 600 feet long to get out of the quarry and this put two cars on the incline at one time, a dangerous condition in case of a runaway.

Loading in this quarry is done by a 120-B Bucyrus-Erie electric shovel with a new-type 4¾-cubic yard Bucyrus dipper. The truck-trailers haul the stone under their own power to the incline formerly used by the empty cars returning to the quarry. This incline is also 600 feet long and has a 10-degree incline. At the foot of the incline a small cable-drawn barney car on a 24-inch track couples automatically to the truck and hauls it with its gears in neutral up the incline at the rate of 6 miles per hour. At the top the car automatically disengages and returns into the quarry for another trip. Two barney cars are used, each operated by a 100-horsepower hoist. This system keeps a steady stream of material flowing to the plant. The truck-trailers proceed under their own power to the primary crusher, where they dump their loads and proceed down the other incline back into the quarry.

This system of haulage has already proved very satisfactory as it has been in use only since August 18 and 3,600 cubic yards of material has been hauled up in an 8-hour day. It was expected that the 4,000-cubic yard mark would be reached in a very few days. It has already enabled this plant to load, haul

Load of rock being dumped into Clinton Point primary crusher.

Old electric shovel loading a trailer at Clinton Point.

up the incline, dump, and return the truck to the shovel in 5 minutes. The round-trip distance traveled by the truck is 2/3 mile, of which a distance of 600 feet is up a 10-per cent. grade. An electric-eye signal control system is used.

The Verplanck plant has a capacity of 4,800 cubic yards of crushed limestone in an 8-hour day and also produces about 5,000 tons of pulverized limestone per month. This material runs from 20- to 200-mesh and is sold for agricultural use and for asphalt filler.

The truck-trailers at the Clinton Point plant went into operation May 8 of this year. This is the company's newest and largest plant and was completely described in the December 31, 1930 issue of PIT AND QUARRY shortly after it went into operation. Subse-

Signal tower formerly used to direct trucks to proper shovels in Clinton Point quarry.

quent articles have dealt with later developments at this plant. Dump trucks of 5-cubic yard capacity had been used to haul stone to the primary crusher. The fleet of 18 trucks was replaced by ten 10-cubic yard Easton TR-10 trailers hauled by ten tractor-trucks, one Mack and nine Chevrolets. The use of these truck-trailers has increased the capacity of this plant about 1,000 tons daily. The average capacity is 4,500 cubic yards of crushed dolomite and 700 cubic yards of rip rap daily. Some stone sand is also produced. Actually, as much as 5,130 cubic yards of crushed stone has been produced in an 8-hour day.

At this quarry the round-trip haul between the face and the primary crusher averages ⅝ mile. The quarry face is about ¾ mile long and averages 100 feet in height. The quarry floor is level, but is naturally rough and Barrett asphalt roads, which are credited with important savings in truck maintenance, have been laid. A total of over 2 miles of this pavement has been laid in this quarry. This work is done by the company and the material comes from an aggregate-bituminizing plant operated by the Barrett Company on the property.

The loading in this quarry has been done by a 100-B Bucyrus-Erie electric shovel with a 3¾-cubic yard dipper and five Bucyrus-Erie 50-B steam shovels with 1¾-cubic yard dippers. A sixth 50B has been used for loading rip rap weighing from 100 pounds to 6 tons. The five steam shovels used for loading crushed stone will be replaced by the two new 120-B Bucyrus steam shovels previously mentioned. One of the new shovels will load a trailer in

Another view of electric-shovel loading operations at Clinton Point.

one minute compared to 6 or 7 minutes with the smaller old shovels. These shovels, with the 100-B electric shovel are expected to keep the trucks moving and have time to spare for laying out rip rap. With six shovels loading it was difficult for the truck drivers to select the proper one to go to on each trip and a signal house was erected. The tower man would watch the loading from his vantage point and signal each empty truck the proper shovel for his next load. This signal tower will no longer be needed with only three shovels loading.

At this plant the truck-trailers run in on either side of the crusher which happens to be open. On each side is a dumping mechanism similar to the ones used at the other plants. This consists of a hook on a cable operated

Loading a trailer at the 180-foot face in the Haverstraw quarry.

through a hoist and sheaves. A counterbalance holds the hook in the correct position to catch the trailer body when it is lifted. An operator above the crusher controls the dumping mechanism, stone hook crane, the crusher, and other equipment.

Joe Q. Taylor, general superintendent for the New York Trap Rock Corp., assumed his duties on November 7, 1938 and immediately began to put into effect some of his ideas on improving operations. Mr. Taylor has had wide practical experience in this field both in the operation and the construction of plants. While with the Burrell Engineering and Construction Company from 1910 to 1932 one of his jobs was that of superintendent of construction of the Clinton Point plant, which is now one of those under his supervision.

General Superintendent Joe Taylor and Ray Cox, superintendent, pose in front of the scow-captains' recreation hall at Clinton Point.

Mr. Taylor is also a firm believer in the superiority of the steam shovel over other types. It is evident from the small number of new steam shovels being sold that most producers believe otherwise, but the writer has talked to other quarrymen of wide experience and high standing who agree with Mr. Taylor.

As the first step along this line the used Bucyrus-Erie 120 crawler steam shovel was purchased from the Tomkins Cove plant. Exhaustive tests were made and accurate cost records were kept in comparing this shovel with an electric shovel of the same type used in one of the company's other quarries. The results of these tests are interesting as they are quite at variance with prevailing opinion on the relative merits of these two forms of power in shovels. According to Mr. Taylor, it was found that the steam shovel was more flexible and economical and easier to repair in case of a breakdown. Mr. Taylor says the steam shovel dug faster and had a faster swing and could not be stalled. As a result of these tests the company has ordered two new Bucyrus-Erie 120-B crawler steam shovels with 5-cubic yard dippers to be used in the Clinton Point quarry. These are said to be the third and fourth steam shovels of this type ever made and the first made since 1928. The new shovels are expected to perform better than the old 120-B steam shovel due to more efficient boilers and other improvements. The company will then have four 120-B shovels, one electric and three steam, with all parts interchangeable except those of the steam and electric power-plants. This, according to Mr. Taylor, will considerably reduce the inventory of spare parts required and contribute to lower maintenance costs.

It has been mentioned that two new Bucyrus-Erie T-29 electric 9-inch well drills were installed at the Haverstraw plant to replace the old 7-inch drills. Two such drills were also installed at the Verplanck plant, two at the Clinton Point plant and one at the Tomkins Cove plant. The addition of a new Ingersoll-Rand wagon drill at Havershaw was also mentioned. These have cut drilling and blasting costs considerably in spite of the limitations placed on the size of shots. Similar units were also added at Clinton Point and Tomkins Cove to shoot out the toes caused by the 2-hole shots permitted.

Lubrication (*from page 33*)

In circulation, splash, bath, and ring oiling systems the oil is used over and over for considerable periods of time. On the contrary, in hand and drop-feed systems the oil is used for a comparatively short period of time. The former methods require a high-quality oil possessing maximum physical and chemical stability, which is characteristic of highly filtered, neutral, pure mineral oil. For hand and drop-feed oiling a relatively poor quality oil is generally cheaper, and, since it is not required to withstand long, continuous service, it is quite satisfactory.

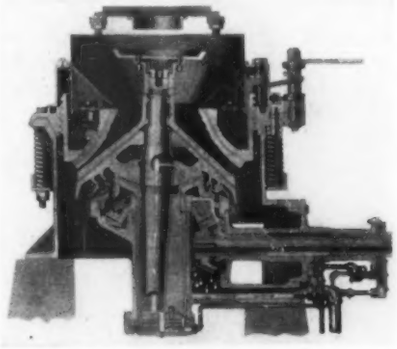


Figure 8. Circulation-oiled gyratory crusher.

Lime-base greases are generally cheaper than soda-base greases and equally satisfactory for relatively slow speeds and where temperatures do not exceed 160 degrees F. All lime-base greases contain a small percentage of free water which is necessary to prevent separation of the soap base and mineral oil. At high temperatures this free water is evaporated and at high speeds it is thrown out by centrifugal force, thus allowing separation of the oil and soap base. On the other hand, soda-base greases do not contain free water, hence are stable at high speeds and temperatures.

German Cement Mills Operate at Top Speed to Supply Increased Demand

This article, written before Germany went to war, should prove interesting inasmuch as it points out the utilization of by-product materials in manufacture as a step in the conservation of its rather limited natural resources.

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ONLY a relatively short time ago the German cement industry was suffering severely from considerable overproduction and all manner of devices were used to restrict output and avoid harmful competition. Now, however, the German industry's productive facilities have become entirely inadequate for supplying the greatly increased and steadily increasing demand for cement. In consequence, plans have been drawn up for a considerable enlargement of the industry and it is reported that total annual productive capacity will be increased by around 2,500,000 metric tons to more than 19,000,000 tons by the end of 1939, compared with a total productive capacity of about 17,000,000 tons at the end of 1938, 16,600,000 tons at the end of 1937, and 16,100,000 at the end of 1936. Allowing for taking time out in certain parts of the year for repairs, renewals, and the like, it is anticipated that Germany's total cement production in 1939 will attain the record-breaking level of 18,000,000 metric tons, compared with 15,600,000 tons in 1938, 12,600,000 tons in 1937, and 11,600,000 tons in 1936.

Although the German cement industry is now operating at full capacity, the demand for cement with respect to capacity varies in the different producing districts of the country, so that it has been necessary to plan the enlargement of the industry in such a way that capacity will be increased only in the districts where the demand exceeds local production facilities. Concentration of capacity, especially in western Germany, has presented a problem for the industry as a whole, since capacity in this district still exceeds normal requirements.

Austrian and Sudeten Plants.—The total capacity of the German cement industry was enlarged in 1938 by the addition of the producing plants of the two annexed territories, and it is planned to increase productivity in these new areas.

The Austrian cement industry includes 13 cement plants with a credited annual capacity of about 940,000 metric tons, which in 1937 produced 420,000 tons of cement, or about 43 per cent. of capacity. Since annexation Austrian cement production has been accelerated and is expected to increase following the contemplated enlargements. Eight separate cement-manufacturing companies operate the plants, but the greater part of the output is controlled by one concern—the Aktiengesellschaft der Hydraulischen Kalk und Portland Cementfabrik zu Perlmoos, with an annual capacity of 630,000 metric tons. This leading concern, with a total stock capital of 15,400,000 schillings, possesses extensive world-famous deposits of cement rock at Perlmoos. Austrian plants are reported to be modern and in general on a par technically with the industry in the old Reich.

In Sudetenland three cement plants —at Stramberg, Tschischkowitz, Settenz—have a credited capacity of about 450,000 tons annually. The plant at Stramburg, with an annual capacity of about 250,000 tons, is the most important. Expansion of the Sudeten cement plants is planned to supply the deficiency in eastern Germany.

As for smelter or metallurgical cement (slag cement) in Germany, the rising output of this low-cost type of cement has made it difficult for the ordinary Portland-cement manufacturers, especially in western Germany. With marked gains in the output of iron and steel in the Rhenisch-Westphalian district, metallurgical cement has increased notably, production exceeding 1,100,000 tons in 1938. Moreover, this type of cement is destined to play a considerably more important *rôle* in Germany's cement economy in the future because of its low cost of production, good quality, and, more specifically, because of the development of large-scale production of iron from low-grade German iron ores with high silica content by a new so-called acid smelting process, by which greater amounts of blast-furnace slag are produced, the slag being excellent raw material for making high-grade cement. However, despite the existing national insufficiency of cement capacity, further increase in slag-cement capacity has been restricted to avoid aggravating the existing market condition. Hence, future increase of production of so-called acid slag will depend largely upon the extent to which slag may be used for other industrial purposes. For instance, scientific research already has established that by adding certain amounts of low-grade bauxite mixed with soda ash the acid slag can be used as a source of alumina.

The German cement industry is highly cartelized. Producers are organized in four major regional associations or syndicates, which govern market conditions, adjust output to demand, establish sales quotas, and, in general, avoid harmful competition. Considerable friction has developed at times, especially during economic depressions, among the various regional syndicates due to disputes about sales by one group in the territory ordinarily served by another group. Under the national inter-cartel set-up of sales quotas producers organized in the Western German Portland Cement Association have a combined sales quota of 24.2 per cent. of the national market, those in the South German Association 24.4 per cent., the North German Asso-

(Continued on page 50)

Table II—PRODUCTIVITY OF THE GERMAN CEMENT INDUSTRY

Year	Existing Plants	Plants in Operation	Workers *(end of year)*	Total Pay-roll *(1,000 marks)*
1933	...	76	8,542	17,957
1934	...	92	13,739	26,083
1935	135	109	16,690	34,146
1936	128	113	19,554	40,385
1937	125	112	19,892	44,234

Table I—CEMENT PRODUCTION IN GERMANY (EXCLUDING AUSTRIA AND SUDETENLAND)
(thousands of metric tons)

Year	Total Output	Composition of Output			
		Portland Cement	Ferro-Portland Cement	Blast-Furnace Cement	Other Cements
1933	3,820	3,111	358	235	116
1934	6,470	5,331	599	354	186
1935	8,807	7,257	852	460	238
1936	11,689	9,399	1,017	743	530
1937	12,605	10,037	1,086	909	573

New plant of the Myers Gravel & Sand Company at Anderson, Indiana, showing cableway scraper dumping over grizzly 75 feet up.

Myers Gravel & Sand Co. Shifts Operations to Better Deposit

THE Myers Gravel & Sand Company started business in 1922 at a deposit on the south side of Anderson, Indiana. Fifteen years later the deposit gave evidence of exhaustion of good material and, with specifications becoming increasingly rigid, Claude P. Myers, president of the company, began prospecting for a new source of supply. A creek bottom 65 acres in area located along the old Alexandria Pike immediately north of Anderson was finally chosen and a new plant erected on the site this Spring. Tests show that good gravel and sand extend to a depth of at least 60 feet. There are few bowlders and a very small amount of chert, shale and other deleterious material in the deposit.

The overburden, averaging about 7 feet in thickness, is stripped by a General ½-cubic yard drag-line and the material to be processed is taken out by a Sauerman slack-line cableway excavator equipped with a 1-cubic yard bucket and supported by a 100-foot steel mast. Power for the cableway is furnished by an 80-horsepower Street Brothers electric hoist. The cableway is now operating on a span of about 300 feet, with provision for extending the span to about twice this distance when it becomes necessary.

At a height of about 75 feet the bucket discharges over an inclined grizzly, which has 5-inch by 10-inch rectangular openings and removes the large pieces that are occasionally brought up. Beneath is a steel hopper equipped with a chute which carries the material from the tipple to the screening-and-crushing plant.

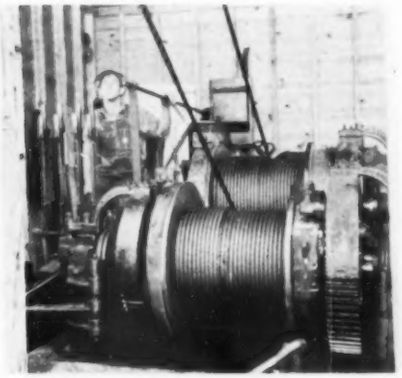
Originally the chute was formed of steel plate with ⅜-inch openings to take out the sand, putting the gravel on the screen without water. This proved unsatisfactory, however, and a solid chute is now employed, water being introduced through a 1-inch pipe with ¼-inch openings in the chute.

In the plant proper the chute discharges to a Simplicity triple-deck screen with 2-inch, 1⅛-inch and ⅜-inch openings. Material retained on the top deck is scalped out for discharge to a 12-inch by 16-inch Universal jaw-crusher and the crusher-run product passes without further sizing to a separate hopper bin for truck-loading.

This winter, however, Mr. Myers plans to add a secondary gyratory crusher, installing it in closed circuit with the Simplicity screen to increase the plant's output of crushed material in all sizes.

Material retained on the second and third decks passes to the No. 1 and No. 2 circular steel bins. That which passes through the screen, smaller than ⅜ inch in size, goes to a Leahy double-deck vibrating screen with $^{3}/_{16}$-inch openings on the top and Number 6 mesh on the lower deck. The ⅜-inch to $^{3}/_{16}$-inch material retained on the upper deck of this screen drops to the Number 3 bin, while that retained on the second deck goes to the Number 4, or sand, bin after being dewatered in a cone-type settling tank. Fine sand passing

(Continued on page 41)

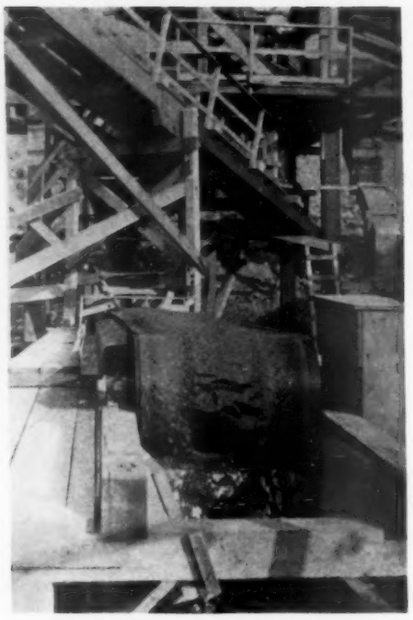


Operator at controls of hoist which powers the slack-line cableway scraper.

The triple-deck vibrating screen for gravel.

Jaw-crusher which reduces oversize material.

LEFT—A view of the plant with main and return conveyor-belts in foreground; sand and gravel stacking belts in rear. BELOW—Sand-dewatering conveyor at discharge end. Note dryness of the sand.



New Plant Supplies Aggregates for Aqueduct Pipe Operations

THE September, 1939, issue of PIT AND QUARRY contained an article describing the concrete-pipe manufacturing operations of the Lock Joint Pipe Company near Framingham, Massachusetts. Two large and highly-efficient plants were erected in which pipes up to 150-inch diameter are being made for an extension of the Wachusett Aqueduct which will carry water to the metropolitan area of Boston.

The sand and gravel used in making these pipes are supplied by a plant also operated by the Lock Joint Pipe Company. This plant, which is only three miles from the Natick pipe plant and 11 miles from the Southboro plant, has a capacity of 100 to 125 cubic yards per hour. It was designed by the Kennedy-Van Saun Manufacturing & Engineering Company, which also supplied all the equipment. Cross perforated plate is used on the screens and New York Rubber Company belting on the conveyors. Construction of the plant was begun February 22 and the first material was shipped April 21.

The deposit, which had never been worked before, is glacial, and contains over 60 per cent. gravel. The overburden, averaging 2 feet in depth, is removed. Excavating of the deposit is being carried to a depth of 18 feet by a Northwest ¾-cubic yard gasoline shovel. Hired trucks haul the material to a ramp, from which it is discharged through a 9-inch grizzly over a hopper feeding a vibrating scalping screen. The 5-foot by 9-foot Kennedy-Van Saun single-deck screen is equipped with Cross corrugated high-carbon steel plate with 2-inch square openings.

Material retained on this screen averages about half of the total and is discharged into a Number 12 Kennedy-Van Saun gearless gyratory crusher. This is driven by a 75-horsepower vertical motor through V-belts. The minus 1½-inch crusher product is discharged on the main belt-conveyor.

The material passing through this screen drops into a stone box, from which it is discharged through a sliding gate on a belt-feeder to the main belt-conveyor from which the feeder is driven. This feeder evens out the feed to the conveyor and the remainder of the plant and contributes materially to its efficiency and capacity.

The main belt-conveyor is 24 inches wide and 90 feet from center to center of the pulleys and is driven by a 15-horsepower motor through Gates V-belts. The material is discharged from this belt to a 4-foot by 16-foot triple-deck Kennedy-Van Saun vibrating screen, which is equipped entirely with Cross corrugated high-carbon steel plate. The top deck is fitted with plates having 1½-inch square and 1½-inch hexagonal openings. The second and third decks are equipped with plates having ⅝-inch and ¼-inch square holes, respectively.

Material retained on the top deck of

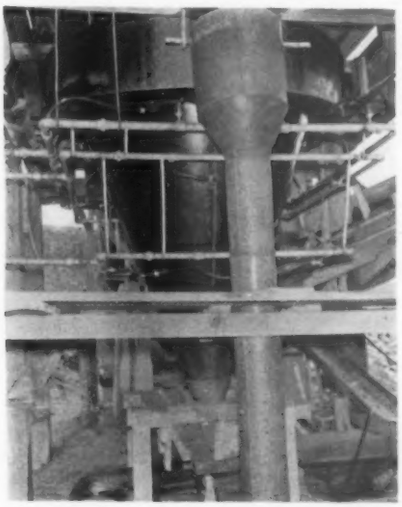
The two gearless gyratory crushers with V-belt drives. The Number 12 primary machine at the left has its vertical motor shown. The Number 25½ secondary is at the right.

this screen is discharged into a Number 25½ Kennedy gearless gyratory crusher which is driven by a 40-horsepower motor. An 18-inch by 60-foot belt-conveyor, driven by a 5-horsepower motor through Gates V-belts, carries the crushed material to the main belt.

The material retained on the second and third decks is discharged on an 18-inch by 100-foot inclined stock-piling belt-conveyor, which is driven by a 7½-horsepower motor through Gates V-belts. A stock-pile 45 feet high is built up by this conveyor. This material is 75 per cent. crushed.

The fine material passing through the bottom deck of the final sizing screen goes into an 8-foot diameter Kennedy washing classifier and dewaterer. The partially dewatered sand is discharged on a 30-inch by 30-foot horizontal belt-conveyor, which is used for dewatering. This belt is troughed in the usual manner at the point of feed, but becomes flat at its middle point and convex in cross section at its discharge end. The gradual tapering off allows drainage of most of the remaining water from the sand on the belt with the least spillage. The sand discharged from the cone contains from 14 to 18 per cent. moisture and this is reduced on the belt to about 5 per cent. The sand is stock-pilled by an 18-inch by 135-foot inclined belt-conveyor.

Sand and gravel are loaded into trucks by a ¾-cubic yard Northwest gasoline crane. Deliveries are made in hired trucks at the rate of 800 to 1,000 cubic yards daily. Water for washing purposes is obtained from a near well owned by the town of Framingham.



The 8-foot cone classifier and dewaterer which discharges to the belt beneath.

Sizing screen with return side of main conveyor belt above.

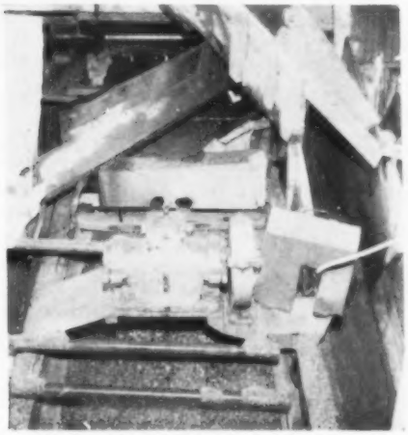
Truck dumping from trestle into the hopper over primary crusher and scalping screen.

Frank Generazio, owner; H. R. Jaques, Kennedy-Van Saun representative, and H. C. Gibson, plant superintendent.

Myers *(from page 39)*

through is flumed to a stock-pile. Water is added at both screens, being supplied by 4-inch and 2½-inch Dean-Hill centrifugal pumps.

Material is sized to conform to specifications of the Indiana Department of Highways which uses a large portion of the output. The daily capacity of the plant is about 350 cubic yards.



Double-deck sand screen in the Myers plant.

Shipments are made entirely by motor trucks, the company operating four Chevrolet 3-cubic yard dump trucks of its own.

All the equipment is electrically driven by public-utility power. The crusher is powered, through a flat-belt drive, by a 25-horsepower General Electric motor, the hoist and screens having individual, self-contained motors.

Hydraulic Cement Output Suffered 1938 Decline

Hydraulic cements other than Portland cement—which include natural and slag-lime (so-called pozzuolan) cements, and masonry cements of the natural cement class—produced in the United States in 1938, as reported by the Bureau of Mines, amounted to 1,704,662 bbl., which represents a decrease of 10 per cent. in comparison with 1937. In 1938 there were shipped from the mills 1,745,541 bbl. of these cements, valued at $2,558,077, a decrease of 7 per cent. in quantity and of 0.8 per cent. in gross value as compared with 1937. The average factory value per bbl. of the product shipped from the mills was $1.47 in 1938; and $1.38 in 1937.

Natural cement (including masonry cement of the natural-cement class and hydraulic lime) was produced at and shipments were made from nine plants in 1938. The plants engaged in the manufacture of natural cement in 1938 were located at Speed, Indiana; Fort Scott, Kansas; Mankato, Minnesota; Akron and Rosendale, New York; Lisbon, Ohio; and Siegfried, Pennsylvania. Two producers (with one plant each, located respectively, at Riverton, Virginia, and Highcliff, Wisconsin) reported an output of hydraulic lime in 1938.

Practicing Safety Brings Worthwhile Results for the Columbia Quarry Co.

By E. A. HEISE, Superintendent

UNTIL the fall of 1930 little thought was given to accident prevention by the Columbia Quarry Company, except that a few "Danger" and good-housekeeping signs had been posted in the shop and plant buildings. A bottle of iodine and a small supply of bandages constituted the only first-aid supplies and these were kept in the office and as a consequence infection cases were numerous.

The company was awarded a large rip-rap order, in addition to several big crushed-stone orders, resulting in the employment of many new men. Rip-rap loading is considered one of the most hazardous types of quarry work and many of the new men had had practically no experience in the tasks involved in the handling of stone, such as sledging, loading into boxes, etc. As a result there were many accidents—31 lost-time accidents and 17 no-lost-time accidents in the rip-rap work, which totaled 599 days' lost time and 1 fatality. Accidents in the plant, quarry and shop departments had also increased to a total of 29 cases, 15 lost-time cases and 14 no-lost-time cases, resulting in a total of 134 days of lost time. The rip-rap loading was carried on at quarry "A" which adjoins the main quarry where the plant is located.

President E. J. Krause determined to cut down the accident toll and visited several large plants and studied their accident-prevention programs. A safety program was then adopted and put into effect at all plants operated by the Columbia company under the personal supervision of C. H. Krause, vice-president of the company.

M. P. Greer, safety engineer of the Marquette Cement Manufacturing Company, Cape Girardeau, Missouri, was invited to the first mass meeting of all Columbia employees and the Marquette program, which had been such an important factor in eliminating accidents at its quarry and cement plant, was thoroughly discussed.

The writer, then employed in the office and handling the accident reports, etc., was appointed safety engineer and was sent to the Marquette plant for several weeks to study its program, the method of conducting the meetings, machinery guards, etc. During this period a course in first-aid training was taken along with a class of Marquette employees, the Bureau of Mines giving each man a 15-hour course in first-aid work.

Employees of Quarry Number 1. E. A. Heise seated behind trophy.

After the safety engineer's return to quarry Number 1, notices about the new accident-prevention program were distributed to all employees, requesting their coöperation in reporting to the first-aid room for the treatment of all injuries. The first-aid room was equipped with a complete stock of modern first-aid supplies and appliances.

A safety committee, consisting of the foremen and workmen from all the departments, was appointed to meet regularly. All the foremen were held responsible for conditions in their respective departments and encouraged always to set a good example for their men by doing all their work safely.

Bulletin boards were erected in all the departments, with a separate board in the office time-clock room for general bulletins and notices. Accident records for each department for the past several years were analyzed and tabulated as to causes, with suggestions for preventing their recurrence.

An inspection trip was made by the safety engineer in the company of the foreman of each department and the plant and quarry superintendent to decide as to necessary guards and to observe unsafe practices. Plans were made for these inspection trips at regular intervals.

A set of safe-practice rules, suggested and recommended by the National Safety Council, was adopted and rigidly enforced. The company also enrolled as a member of the National Safety Council and entered the National Crushed Stone Association and Bureau of Mines safety contests.

Arrangements were made to have the Bureau of Mines send its first-aid car to Columbia, Illinois, and every employee was given a 15-hour course in first-aid. Classes were held daily and the employees paid for their time spent in taking the course. The Illinois Department of Mines and Minerals also had a representative present at all the meetings. He worked with the Bureau of Mines instructors in teaching the men. This training impressed upon the worker the seriousness of accidents and the necessity for immediate, careful treatment making every man safety conscious. Since this training course has been completed first-aid meetings have been held regularly and the entire course has been reviewed. Safety teams have been organized among the employees, and each team is given problems in first-aid to the injured, with an employee acting as the injured man. This includes the application of splints, treatment for shock, arterial bleeding and artificial respiration.

All employees were required to pass a physical examination by the company physician, and a rule was adopted to the effect that in the future every new employee must be examined before being accepted for employment.

Guarding Machinery.—The proper guarding of all the machinery throughout the plant and shop was the next important step. The practice of cor-

recting all unsafe and hazardous conditions reported by the employees has always been encouraged by the company and all the foremen were instructed to guard adequately all new machinery at the time of its installation. The men are always invited to offer their suggestions, whether it be for their safety or to improve working conditions in their departments. This stand has demonstrated the company's sincerity in promoting safety and the men have responded by whole-hearted coöperation in the program.

The steps taken to guard machinery and eliminate hazardous conditions were as follows:

1. All gears, belts, pulleys, etc., were adequately guarded.

2. A winch, used to hoist the drill steels on a wagon drill, had been located on the same side of the drill where the steels were held suspended overhead, with the liability of injury to the operator, should the steels fall. To eliminate this hazard the winch was moved to the opposite side of the drill, placing the operator in the clear from falling steels.

3. Ropes were fastened to the electric power-shovel cable, with insulated hooks which are used to move the cable. Whenever possible, the power is cut off when the cable is being moved.

4. Signal lights were installed beneath the plant bins and track scale. When a bin in the plant becomes full of stone and ready to be unloaded to railroad cars, the bin attendant in the plant switches on a light located at the scale. On observing the signal the scale crew also presses a switch which turns on a light located above the bin in the plant, indicating that the bin will be immediately unloaded. After unloading the bin the scale crew switches off the light. This type of signal informs the scale crew that a bin must be unloaded and gives warning to the bin attendant not to enter the bin, and keeps the plant operating continuously without shutdowns due to the bins being full.

5. Safety cables were installed on the "hog" rods of the steam shovels, supporting the boom, the rods extending from the tip of the boom to the A-frame of the shovel. The cables do not support the boom but extend only along the rods, being fastened to the tip of the boom at one end and to the A-frame at the opposite end. Steel bands are fastened around the rod and cables. Should the rod break, the cables would support the boom and prevent the rod from falling. Several years ago one of these rods broke and narrowly missed the crane man, seated on the side of the boom, when it fell. A similar cable is installed on the rod extending from the A-frame back to the rear frame of the shovel. In case the rod should break, the cable would still support the A-frame, preventing the boom from falling into the pit.

6. Water for the steam shovels and "dinkey" boilers is furnished from a large lake near the quarry. Formerly it was necessary to go down a steep bank to get to the water-control lever on the pump. During wet weather and in the winter the path was very wet and slippery; even with steps being cut into the bank and a rope extending along the steps for support, it was a hazardous task. To relieve the pump man from traveling up and down this steep bank, an automatic switch was installed on the tank to control the water level in the tank at all times.

7. All movable ladders in the shop and plant were equipped with shoes, and stationary ladders were securely fastened.

8. Foot boards, with upright toe boards at the rear, were installed on the steam locomotives and gasoline cranes.

9. Hand railing was installed on all the steps and walkways, and all the floors were repaired where necessary.

10. A siren was installed in the plant. Before any machinery is put in motion the plant foreman gives two blasts on the siren. The men on the upper floors of the plant return the signal if the machinery is ready to operate. If no return signal is given, the foreman knows they are still working on the machinery and the plant is not started until the return signal is given. In case a quick shut-down of the machinery is necessary, one blast on the siren is used.

11. The Number 18 primary crusher also has an emergency switch which can be used in case it is necessary to stop it immediately. This switch is tested frequently to be sure that it is always in good working condition.

Installation of these and many other miscellaneous safety devices shows the men that the company is vitally interested in their welfare, and it has also resulted in improved operating conditions about the plant and quarry.

Concrete and steel construction is used throughout the plant, minimizing the fire hazard. However, fire extinguishers have been installed in all the wooden buildings, oil houses, boarding houses, storeroom, garage, Diesel-engine room, and on gasoline-engine powered locomotive cranes.

Safety Promotion.—Safety posters, received from the National Safety Council and from other sources, are changed regularly and every effort is made to keep the bulletin boards attractive as well as instructive. Posters are selected for each department with subjects which cover hazards encountered by the men working in that department. News items giving accounts of miscellaneous accidents on the highways and in the home and bulletins covering safety and operation are also posted.

Monthly safety meetings, attended by the superintendent, foreman and all the employees, are held in a meeting room at the quarry, the safety engineer acting as chairman. The superintendent and all the visitors are given an opportunity to address the meeting. All the men are paid for the time spent in attending the meetings, which usually extend over a period of about one hour. A record of the attendance is obtained by a roll call of all the employees.

These meetings usually start with a safe-practice discussion in which all the employees are invited to participate and which is regarded as one of the most important parts of the meeting. Employees are encouraged to report all unsafe practices, so that they may be discussed and corrected and methods adopted for the prevention of accidents. This informal discussion familiarizes the workers with the hazards and safe practices to be observed in all departments and has been adopted in place of the former safety court system.

Some of the safe-practice rules discussed at the meetings are as follows:

1. All employees suffering injury

Loading rip rap in Quarry A, Columbia Quarry Company.

must report to the first-aid room for treatment immediately after injury. Anti-snake bite serum is kept in the first-aid room.

2. Employees are encouraged to wear safety equipment, such as goggles, safety shoes, respirators, dust masks, rubber gloves and safety belts. Safety shoes are highly recommended by the company for use in all departments. A complete stock of various types of shoes is kept on hand for sale to employees at practically cost price at all times.

3. It is compulsory that goggles be worn when sledging stone, chipping, babbitting, grinding with an emery wheel, and whenever there is any danger of flying particles injuring the eye. Welders are instructed to use dark-lens goggles and welding helmets. Masks are furnished for wearing in dusty places of work, although no harmful amount of silica is present in the limestone handled at this plant.

4. Tools, machinery, electrical equipment, ropes and cables must be maintained in a safe condition and regularly inspected. Good housekeeping is always encouraged.

Air-compressor flywheel guard.

5. A practical standard code of signals has been adopted to avoid misunderstandings which may result in accidents.

6. Employees must not walk under suspended loads.

7. No smoking or open lights are allowed while handling explosives, gasoline, etc. All gasoline must be carried in closed containers.

8. When cleaning elevator pits or when working where there is danger of falling material, employees must wear skullguards for head protection.

9. Foremen and older employees are to instruct new men as to hazards, safe practices and rules to be observed in the different departments.

10. When applying stick belt dressing, workmen are urged to apply the dressing with the belt moving away from the pulley, but the use of resin is suggested in place of belt dressing.

11. Track repairmen are cautioned to move back from the track and walking on the rails is forbidden. All employees are asked to step over the rails when crossing railroad tracks to avoid injury from falls, slipping, etc.

12. When blasting, proper signals must be given and all employees must seek shelter. Whenever possible, blasting is done before and after working hours and during the noon hour. Explosives are handled by men who are familiar with their use. The number of shots fired at one time must allow the powder man time in which to reach shelter. Boxes of dynamite must be opened with a wooden mallet and wedge.

After the safe-practice discussion a report is made on the safety records of the plant and other plants in the safety contests.

There is also a discussion of all first-aid cases, accidents and near accidents at the plant as well as accidents in the home and on highways. Questions may also be brought up concerning employees' welfare, insurance benefits, etc.

Safety calendars are distributed to the men each year.

Rip-Rap Loading.—All the men employed in rip-rap loading must wear safety shoes and goggles. Sweat bands are furnished upon request. The men are requested to wear gloves or hand pads and many of the men wear aprons of a heavy material to save wear and tear of the clothing. All tools are kept in good condition. Jigger-drilling is not permitted where men are loading stone as the noise of the drills prevents the men from observing movements of the stone usually heard at the start of a slide.

Safe blasting practices, previously mentioned, are also carried out in the rip-rap work.

Due to the fact that it is far more hazardous to load from a mixed pile of stone and dirt, with the attendant danger of slides and movement of stone, especially so in wet weather, all the rip-rap stone is stripped and contains very little degradation. All the spalls are removed and sent to the plant for crushing and the areas in which the men load are kept as clean and free from loose stone as possible. Loose and overhanging stone are barred down by the drillers and the larger stone is blasted when too big for the men to sledge.

Loading rip-rap by hand is hazardous work and the worker himself can do much to avoid injury by handling the stone in a safe manner, observing cracked pieces, sharp edges and by lifting the stone correctly, using the leg instead of the back muscles. Workers are cautioned about undermining the bank and to move to safety in case of a slide.

Safety Awards.—During the past 8 years of safety work, the Columbia Quarry Company has been awarded first place in the National Crushed Stone Association Safety Contest for three consecutive years, 1935, 1936, and 1937, and also awarded two certificates of honorable mention for the years 1933 and 1934. Quarry Number 1 also completed the year 1938 without a lost-time accident and was presented with the *Explosives Engineer* award as its permanent property at the recent National Crushed Stone Association convention held in Cincinnati during January, 1939.

Certificates have also been received from the Bureau of Mines and the Illinois State Department of Mines and Minerals for 100 per cent. training of all employees in first-aid.

The company also has received a Joseph A. Holmes Certificate of Award for its outstanding record of operating a working force of 110-men from September 22, 1932, to February 1, 1938. The total man-hours worked at Quarry Number 1 without a lost-time accident to January 1, 1939, was 1,221,202. It is, to date, still operating with a clear record.

Below is a report showing the accident experience and man-hours worked each year since the start of the Safety Program:

Year	Man-hours	Total Cases	Lost-Time Cases	No-Lost-Time Cases	Total Days Lost-Time
1930	No record	77	46	31	824 (1 death)
1931	162,925	3	2	1	45
1932	101,379	4	2	2	315
1933	171,645	1	None	1	None
1934	163,340	3	None	3	None
1935	167,671	None	None	None	None
1936	224,342	2	None	2	None
1937	219,069	3	None	3	None
1938	242,477	7	None	7	None

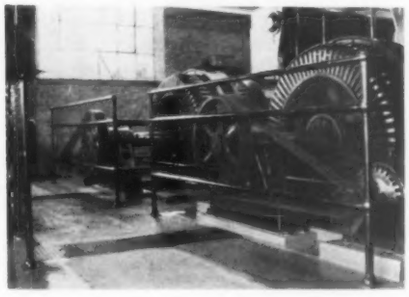
The Quarry Number 1 Safety Record to April 15, 1939, is equivalent to 2,396 days or 6 years, 6 months and 24 days without a lost-time accident.

At the limestone mine of the company located at Valmeyer, Illinois, a similar program has been in effect for the same period of time. This plant has also

completed the years 1931, 1932, 1933 and 1936 without a lost-time accident.

Social Activities.—As part of the safety and employee's welfare programs meetings are held to celebrate the winning and awarding of certificates and trophies. A luncheon and refreshments usually follow the meetings. Picnics are held several times each year for all the employees and their families at a park and swimming pool maintained by the company.

A meeting room is also located at the park, where dancing is held in the evening. Athletics are encouraged and

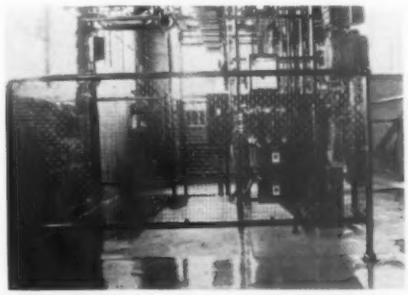


Guard railing in power plant.

a baseball team is sponsored by the company. The team is composed of the younger quarry workers and has entered leagues of community teams and has won three trophies in recent years.

The employees have organized a fishing club known as the Quarry Lakes Fishing Club, with the writer as president, and have leased the three lakes on the Quarry Number 1 property. A club house has been erected and the lakes are being stocked. Membership in the club is reserved for quarry employees only, the employees doing the labor work about the grounds during their spare time. This park and the lakes afford the employees a place to spend their leisure hours and enjoy a good day's fishing. It also promotes good fellowship among the workers, which is very essential in building up a good safety record.

The officials and employees of the company are very proud of the record they have established and with a united, coöperative effort, hope to complete 1939 with a clear record.



Power-plant switchboard inclosure.

Getting the Most Out of Shovel and Crane Ropes

By F. L. SPANGLER, M.E.

THE closing lines of clam-shell cranes and the hoist lines of dipper shovels used in pits and quarries are subjected to very severe fatigue and wear conditions. Frequent replacement is the rule. It is possible, however, to extend very considerably the life of these ropes by making such changes at frequent intervals as will cause new sections of the rope to be brought into the vicinity of the sheaves. Thus the bending action on the rope will be distributed over a longer length than would be the case if the rope were never changed between the time of its installation and the day on which it is condemned and retired.

Reverse bends is one of the most severe conditions that a wire rope can encounter. For that reason the closing clam-shell line will show early breakage of wires from fatigue stresses in the short length that works over the sheaves in the closing mechanism. By cutting a few feet off the clam-shell end of the rope at frequent intervals the Consumers Company of Chicago is extending the service life of its ropes three and four times according to its general superintendent, F. W. Grear. The rope is made long enough at the start to allow this periodic shortening without hindering the operation of the crane. Each time the end of the rope is cropped the new end is threaded through the closing mechanism and fastened to the padlock. If the rope is too short to allow cropping of the end, turning the rope end for end will give further life.

In the case of the dipper shovel the severest strain is imposed in that short section of the cable which passes around the dipper sheave at the moment the dipper is taking its "bite". It is here that fatigue breaks first develop in the rope wires. The sheave at the boom point also produces fatigue in the rope, but not so severe as at the dipper. By cropping two or three feet off the rope at the padlock end new sections of the rope are brought into contact with these sheaves, and those sections that have already been weakened through working on the sheaves are now moved into positions away from the sheaves, where fatigue action is slight and of little consequence. Quarries that have adopted this method are said to be finding it successful in increasing the life of the rope.

Thus a periodic cropping of the padlock end of the cable enables the cable to be used several times as long as would be possible if it had to be discarded as soon as one small section showed weakness. Also, as in the case of the closing cable of the clam bucket, the rope can be turned end for end if it is too short to be cropped.

For constant working over small sheaves preformed rope shows a longer life than non-preformed, say many quarry operators who have had experience with both. This is explained by the greater ability of the preformed rope to resist fatigue. Also, while seizing of the rope on both sides of the cut before cropping is required for all kinds of non-preformed rope, it is needless in the case of preformed, which does not show a tendency for the individual strands and wires to fly out or "explode" at the cut end. Also, the preformed rope is much less "cranky" than the non-preformed and is therefore easier to reeve when the cropping of the rope end makes re-reeving necessary.

The boom cables of cranes and draglines do not receive the abuse to which most of the other cables are subjected. Yet, since these cables would likely inflict much damage should they break, they are replaced before any considerable evidence of weakness is present. These cables should be replaced without fail at the end of four or five years, if their condition has not required replacement before then. The Consumers Company of Chicago uses these cables as hoisting cables on cranes after they have served their purpose as boom cables.

The operator of the machine has much to do with the service obtained from the cables. A good shovel or crane operator will get the greatest life out of the equipment with the least maintenance, and yet set production records that the poor operator can not reach with all his attempt at making speed. The operator who doesn't "spot" his work properly, and who bangs his shovel into the load is bound to snap a cable occasionally, and to put dangerously-high stresses in the boom, sticks, and frame of his machine. This situation is considerably aggravated when digging into rock or other solid material.

Careless operators have been known to start the shovel swinging with the throttle wide open. Such operation may snap the turn cable in two. The careful operator will pick up speed gradually as the shovel swings around, and he will ease his shovel up to the load and give it a chance to "bite in" without a shock or jar.

By GEORGE PERAZICH, Executive Engineer
and S. THEODORE WOAL
Works Progress Administration

Technology and Labor Productivity in the Cement Industry, 1920-1938*

DURING the last two decades the technology of manufacturing cement has undergone several significant changes. The 54 new plants constructed since 1920 added materially to the industry's productive capacity and also raised its technical efficiency. The cost of labor per barrel of cement at the plant has declined from 41 cents in 1919 to 27 cents in 1935.[1] These savings were realized in the face of added production difficulties arising from the demand for special cements and for improved quality of the standard product. Additional problems of this type would have increased the cost of production had it not been for the new technical developments. The following discussion shows the changes in the productivity of labor and relates these to improved production techniques and to the types of equipment which were necessary to effect these improvements. The data on labor productivity covering from 56 to 100 cement plants producing between 40 and 60 per cent. of the total industry's output, and sales of machinery are based on field surveys conducted by the Works Progress Administration, National Research Project.

Trend in Labor Productivity.—As Chart 1 illustrates, the productivity of labor was more than doubled between 1920 and 1938, increasing from approximately 1 barrel per man-hour to over 2; the greatest change having occurred during the first 11 years of this period. The rise in output per man-hour or, conversely, the reduction in unit-labor requirements, has been considerably less rapid since 1931 due to the low rate of operation of the industry as well as to the demand for special cements.

An illustration of quality improvement is given by the Portland Cement Association which reports that during the period 1921 to 1925 only 82 per cent. of typical samples of standard product passed through a 200-mesh sieve as compared with nearly 93 per cent. during the period 1931 to 1935. According to the same source, the compressive strength of 6-inch by 12-inch test cylinders at the age of 7 days has almost doubled during this period.[2] Improvements in quality necessitated additional processing. According to one superintendent of a cement mill whose plant we surveyed, with modern equipment and knowledge of production techniques, to-day one-third more cement of the 1920 grade could be turned out per man-hour. In other words, had it not been for improved quality, the labor requirements necessary to turn out 100 barrels would have declined by another 33 per cent.

Improvements in equipment and better knowledge of its use was one of the outstanding reasons for the rapid decline in unit labor requirements. The installation of large-capacity equipment,

LABOR PRODUCTIVITY IN THE CEMENT INDUSTRY, 1919-38

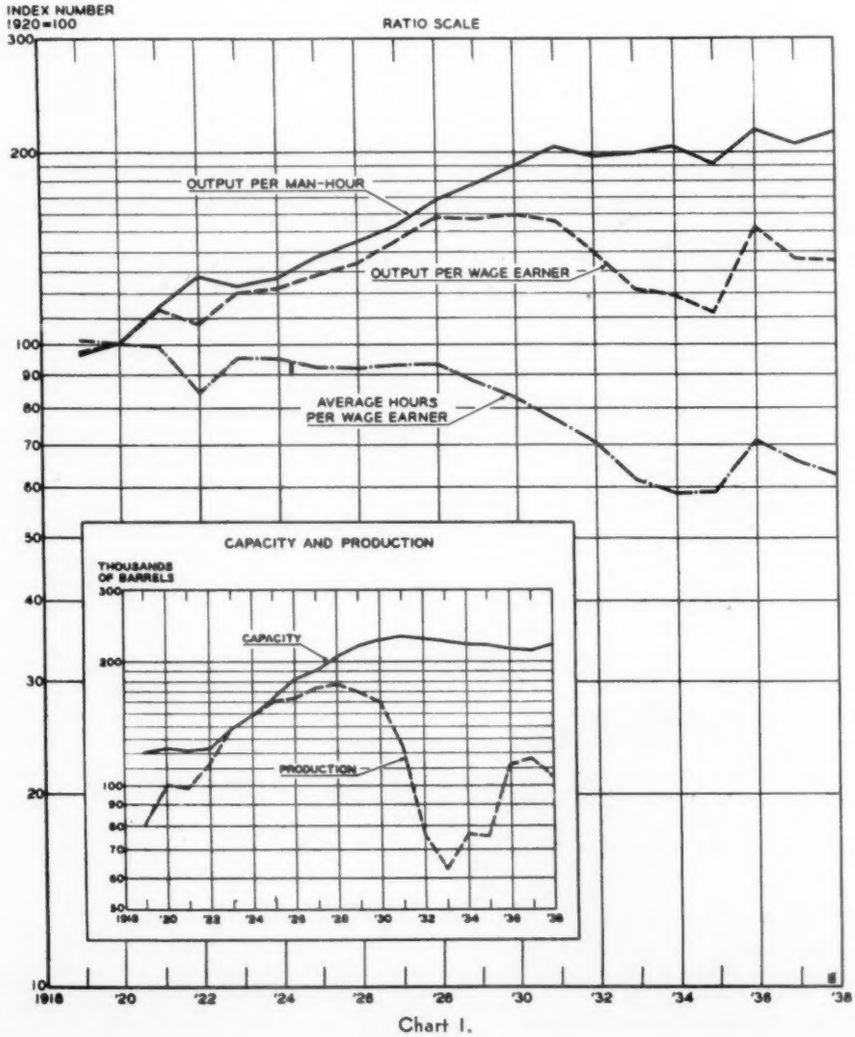


Chart 1.

[1] Nicholas Yaworski, Vivian Spencer, Geoffrey A. Saeger and O. E. Kiessling, *Fuel Efficiency in Cement Manufacture, 1909-1935* (W.P.A. National Research Project in coöperation with U. S. Dept. Int., Bur. Mines, Report No. E-5, Apr. 1938), p. 80.

[2] From letter written by F. R. McMillan, Director of Research, Portland Cement Assn., received May 27, 1937.

* At the time of this writing, a report dealing with "Changes in Technology and Labor Requirements in the Cement Industry," prepared by the authors of this article, was being made ready for publication. The methods employed in the preparation and use of statistics presented here are fully discussed in this report. The field data used in the report were obtained by the WPA National Research Project in coöperation with the National Bureau of Economic Research. This article, summarizing the findings of this study, was prepared with the permission of the Director of the National Research Project.

particularly in the new plants, was also an important factor in reducing unit labor requirements inasmuch as large machines require about the same amount of operating and maintenance labor as do small ones.

Another important technological development was the rapid introduction of the wet-process method of manufacture. Its superiority over the dry process is found primarily in the fact that improved mixing of the raw ingredients yielding a better and more uniform cement is obtained. Although it is probable that the wet process requires somewhat less labor per unit of output than the dry process, the difference in labor requirements as shown in Table I is largely accounted for by the fact that the sample includes a relatively large number of the new, and, thus, more efficient mills. Improvement of quality which the wet process makes possible was the main reason for its widespread adoption. Some of the recent developments, especially improved blending systems and silo storage, would seem to indicate, however, that the disadvantages of the dry process will be soon overcome.

Although there was a pronounced decline in the man-hour requirements during the last two decades, our survey showed a great deal of variation in the labor productivity between different plants in the industry. When the field sample was analyzed, according to the most efficient and least efficient plants, it was found that in 1935 the number of man-hours necessary to turn out 100 barrels of cement was almost half as large in the most efficient group as the average for the industry, while in the least efficient plants the number of man-hours per unit of output fluctuated very widely during the period under consideration and were from two to five times above the average.

Effect of Capacity Utilization on Unit Labor Requirements.—For the purpose of determining the effect of capacity utilization on the number of man-hours necessary to produce 100 barrels of cement, Table II compares the labor requirements in plants operating at a high level of their capacity with those working at a lower level. This comparison discloses that, in general, plants operating at higher capacity have lower man-hour requirements. Of the 60 plants covered by our survey, in 1935 the 30 with the highest rate of operation required only 46 man-hours to produce 100 barrels of cement, while for the remaining 30 plants more than 53 man-hours were necessary to produce the same amount of cement. This difference was more marked in the wet-process plants than in those using the dry process.

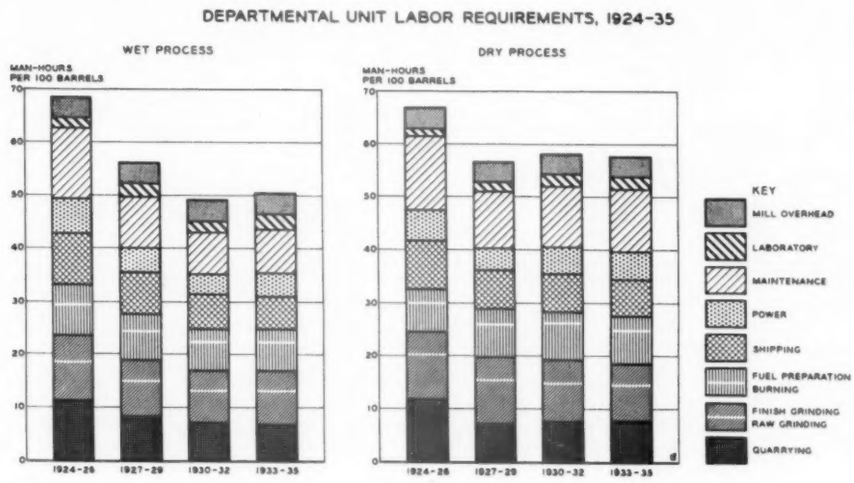


Chart 2.

Age of Plant.—The field sample was also analyzed to determine the effect of the age of the plant on the amount of labor necessary to turn out a barrel of cement. Of the 57 plants which supplied data for the year 1935, 36 were built before 1916 and their man-hour requirements per unit of output were considerably greater than for the remaining plants constructed since then. In the case of five wet-process plants built before 1905 the amount of labor necessary to produce 100 barrels of cement was 20 per cent. higher than for the seven plants of approximately the same average size built since 1926. For the dry-process plants the difference was still more pronounced, as is shown by the figures presented in Table III.

Relationship of Plant Size to Labor Productivity.—According to the data obtained from 25 wet-process plants and 32 using the dry process, in the year 1935 large plants required considerably less labor per barrel than small ones. With higher capacity utilization those plants which were rated at less than one 1,000,000 barrels yearly capacity required 14 per cent. more labor per unit of product than plants with rated capacity over 1,500,000 barrels. Several factors may be considered in explaining this difference. In the first place, most of the large plants are of newer construction, employing more efficient machinery and better techniques. In the second place, large plants usually employ longer kilns and larger grinders, crushers and other equipment units which do not require much more attention than small units either for their operation or maintenance.

Labor Productivity by Departments.—Table IV shows that in 1934 the quarry employed approximately 16 per cent. of the total labor needed to produce a barrel of cement. The crushing and raw-grinding department required 11 per cent.; burning department, less than 10 per cent.; and maintenance department, nearly 18 per cent. Between 1919 and 1934 quarry[3] and maintenance labor declined by 57 and 62 per cent. respectively, while the overall unit labor requirements were reduced by approximately 52 per cent. On the other hand, the labor time necessary in the burning department was reduced by only 19 per cent.

TABLE I—LABOR REQUIREMENTS IN THE MANUFACTURE OF PORTLAND CEMENT, 1925 TO 1935[a]

(Excludes shipping department)

Year	(Man-hours per 100 barrels)		
	All Plants	Wet Plants	Dry Plants
1925	61.0	57.9	62.3
1926	58.9	56.4	60.1
1927	51.6	50.3	52.3
1928	47.4	46.0	48.2
1929	47.3	44.8	48.7
1930	47.4	41.9	49.8
1931	46.2	37.5	50.9
1932	46.3	38.6	49.9
1933	47.4	39.8	50.8
1934	47.6	41.7	50.1
1935	49.5	43.7	52.7

[a] W.P.A. National Research Project.

Chart 2 shows the departmental unit-labor requirements obtained from a sample of plants. The labor requirements in wet-process plants declined by approximately 27 per cent. between the periods 1924 to 1926 and 1933 to 1935 as compared with only 13 per cent. for the dry-process plants. The difference is due primarily to the fact that the wet-process plants included in the sample are of new construction, utilizing the latest technological improvements and therefore are more efficient than the older dry-process plants. This is clearly seen in the maintenance and repair labor which, in the case of wet-process

[3] For a detailed study of technological changes in quarrying, see the W.P.A. National Research Project report on *Changes in Technology and Labor Requirements in the Crushed-Stone Industry*, by Harry S. Kantor and Geoffrey A. Saeger (W.P.A. National Research Project in coöperation with U. S. Dept. Int., Bur. Mines, Report No. E-8, Feb. 1939).

plants, has declined by more than 35 per cent. during this period as compared with less than 20 per cent. for those using the dry process.

For both processes the quarrying of rock appears to have undergone about the same reduction in labor requirements. One of the important factors that accounted for this reduction was the increased use of purchased raw materials. Our field reports, for example, indicate that while in 1935 the plants quarrying all their raw materials required, on the average, 8.5 man-hours per 100 barrels of cement, for five plants that purchased some of their raw materials only 1.8 man-hours were needed.

Other important developments in the quarry were the increased capacity of shovels and locomotives and the shift from steam to electric, gasoline, and Diesel engines. Data obtained from three manufacturers producing approximately 40 per cent. of the total shovel output showed that 440 power shovels were sold to the cement industry between 1920 and 1936. The average dipper capacity of these shovels has risen from less than 1 cubic yard during the early 1920's to more than 1½ cubic yards during the years 1932 to 1934. According to the reports of two manufacturers who sell industrial locomotives to the cement industry, the capacity of these locomotives has also increased from an average of 4.8 tons in 1920 to 13.2 tons in 1936. In addition to the increase in size, the labor productivity was also improved due to the shift in type of power. It was found, for example, that in four of the cement quarries surveyed the replacement of steam shovels by electric shovels caused a reduction in operating labor of between 43 and 67 per cent.

TABLE II.—AVERAGE UNIT LABOR REQUIREMENTS FOR PLANTS OPERATING ABOVE OR BELOW MEDIAN PERCENTAGE UTILIZATION OF CAPACITY, 1925 AND 1935[a]

(Excludes shipping department)

Item	Total		Process			
			Dry		Wet	
	Above	Below	Above	Below	Above	Below
1925						
Number of plants	33	33	22	22	11	11
Percentage of capacity utilized	85.2	66.6	85.8	71.6	81.8	58.2
Man-hours per 100 barrels	58.6	64.3	60.6	64.5	46.8	71.7
1935						
Number of plants	30	30	17	17	13	13
Percentage of capacity utilized	43.7	24.0	41.3	22.2	45.9	28.3
Man-hours per 100 barrels	46.2	53.1	50.3	55.0	41.5	47.0

[a] W.P.A. National Research Project.

In the crushing and raw- and finished-grinding departments the technological developments contributing to a large extent to the more than 50 per cent. reduction in unit-labor requirements were centered around the improvement in the design of the equipment, increase in the capacity of individual units, and the use of additional auxiliary equipment, particularly the air-separator. Practically all plants adopted vibrating screens between the primary and secondary crushers, while a few of the most advanced mills have in recent years close-circuited their secondary crushers. Among the most important refinements in the design of crushers has been the adoption of non-choking concaves and the utilization of stronger metals which are better able to withstand the abrasive action of materials being processed. Non-choking concaves are reported to have made possible a 25- to 50-per cent. rise in productivity in the crushing department and 10 to 20 per cent. power savings.

For the grinding of raw materials and clinker the compartment mill has found widespread application. The sales records of two large manufacturers showed that 63 per cent. of all the mills sold during the years 1930 to 1936 were of the compartment type as compared with less than 18 per cent. of those sold during the period 1920 to 1924. Five of the six new plants purchasing their equipment in 1928 installed compartment mills for their raw and finish grinding.[4]

In the grinding department the most important technological development was the introduction of air-separators and the adoption of closed-circuit grinding technique. According to the records of one large manufacturer of this equipment, between 1925 and 1936 157 units were installed in cement mills. Among all types of cement-making machinery air-separators showed the most rapid recovery after 1933, and in 1937 this same concern reported 77 new installations.

Two of the outstanding developments in the burning department were the introduction of auxiliary equipment and the increase in the length of the kilns. The average length of kiln rose from 117 feet in 1920 to 146 feet in 1935, while the average capacity per kiln rose nearly 40 per cent. during this period. Kiln auxiliaries, such as slurry filters, clinker heat recuperators, and chain systems, while installed primarily to reduce fuel consumption, have in many cases increased the capacity of the kiln, thus contributing to the improvement in labor productivity inasmuch as larger output is obtained with the same amount of labor.

Another factor which has contributed to the reduction in unit-labor requirements in the burning department is the

RATE OF FUEL CONSUMPTION IN THE MANUFACTURE OF HYDRAULIC CEMENT, 1919-35

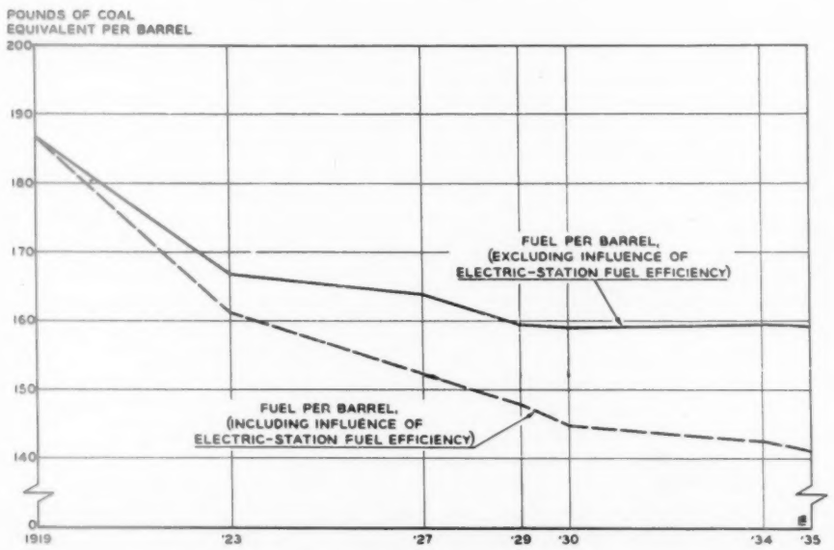


Chart 3.

[4] B. H. Peurner, "Compeb Mill as Modern Grinding for Cement, Raw Materials and Clinker," *Concrete*, Mill Section, Vol. 34 (April 1929), pp. 109-111.

improvement of fuel-preparation techniques and the shift from the use of coal to gas and oil. Substitution of these fuels has eliminated the labor required for crushing, drying and grinding of the coal and also reduced the operating and maintenance labor in this department. The Bureau of Mines records show that the volume of output of finished cement produced by oil and gas has increased from 19 per cent. of the total in 1920 to over 33 per cent. in 1935.[5] Likewise, the number of plants using these fuels has more than doubled during this period.

[5] For 1920, *Mineral Resources of U. S. 1920*, p. 277; for 1935, *Minerals Yearbook, 1937*, p. 1156.

Among other important technological improvements in the coal-burning plants were the integration of drying and pulverizing units and increased use of direct-firing systems. Records of one large manufacturer indicate that at least 91 installations of direct-firing systems were made in the cement industry between 1932 and 1938. Direct-firing systems have furthermore contributed toward a reduction in labor requirements by eliminating a large amount of maintenance previously needed for the up-keep of storage bins, conveyors and driers, and by decreasing the amount of operating labor, since with this type of firing the kiln-maintenance man is frequently able to attend to the operation of the fuel-preparation department. For eight cement plants the change from the bin system to the direct-firing method resulted in more than a 50-per cent. reduction in the cost per ton of coal used.

In the shipping department there were also important technical changes. The adoption of bag-cleaning and automatic bagging machinery was widespread. In one of the plants we surveyed 25 men were eliminated by the installation of modern cleaning equipment.

The substitution of bulk shipping instead of shipping in bags was another important labor-saving technique. According to the Bureau of Mines reports, in 1928 only 2.4 per cent. of the total volume of cement was shipped in bulk as against 20 per cent. in 1934.[6]

Pneumatic conveyors have become very popular for loading and unloading bulk cement. There were more than 130 installations during the decade 1926 to 1936 of one of the most popular sizes.

The collection of dust has been another technique widely employed by the cement industry. According to the available data, in 1938 there were at least 50 plants using electric precipitators, while the records of one company manufacturing the cloth-bag type of collector showed 48 installations between 1928 and 1934. The widespread introduction of dust-collecting technique has resulted in savings in raw materials, in improved health conditions for the workers in the plant, and in the reduction of dust in and around the bearings and gears of machinery, thereby lessening the incidence of break-down and reducing repair and maintenance costs.

Progress in Fuel Efficiency.—Between 1927 and 1935 the labor cost involved in the manufacture of a barrel of cement was reduced by approximately 10 per cent. Similar economies have also been accomplished in the case of fuel and power; these costs having declined from about 35 cents per barrel of cement in 1927 to 29 cents in 1935.[7]

Chart 3 shows the progress in fuel economy between the years 1919 and 1935 and indicates that, considering the progress in fuel efficiency at the electric stations, the amount of fuel per barrel of cement (in coal equivalents) has declined by more than 24 per cent. When the influence of improvements in the electric power station is excluded, the decline amounts to approximately 15 per cent.[8]

Aside from the fuel economies resulting from improvement in central-

[6] *Minerals Yearbook, 1938*, p. 1001.
[7] Yaworski and others, *op. cit.*
[8] *Ibid.*, Table A-6, p. 76.

TABLE III.—LABOR REQUIREMENTS BY PROCESS AND AGE OF PLANT[a]

(Excludes shipping department)

Age of Plant	Wet Process			Dry Process		
	Number of Plants	Percentage of Capacity Utilized	Man-hours per 100 Barrels	Number of Plants	Percentage of Capacity Utilized	Man-hours per 100 Barrels
1925						
Plants constructed:						
1905 and earlier	3	78	61	12	83	57
1906 to 1915	5	79	61	17	75	57
1916 to 1925	8	65	52	2	85	57
1935						
Plants constructed:						
1905 and earlier	5	30	55	8	28	54
1906 to 1915	4	43	45	19	30	55
1916 to 1925	9	38	43	3	35	43
1926 to 1935	7	36	41	2	40	33

[a] W.P.A. National Research Project.

TABLE IV.—CHANGES IN LABOR REQUIREMENTS BETWEEN 1919 AND 1934

	Man-hours per 100 Barrels		Percentage of Reduction
	1919 [a]	1934 [b]	
Total	98.4	47.7	51.5
Quarrying	18.1	7.7	57.4
Processing	35.4	18.1	48.9
Raw grinding [c]	11.4	5.3	53.5
Burning	5.7	4.6	19.2
Finish grinding	7.1	3.1	56.3
Fuel preparation	3.7	1.5	59.4
Power	7.5	3.6	52.0
	22.5	8.5	62.2
Maintenance [d]	9.9	7.1	28.2
Mill overhead [e]	12.5	6.3	49.6
Shipping			

[a] H. E. Hilts, "Shall the State Own and Operate Its Own Portland-Cement Plants?" *Public Roads* (U. S. Dept. Agr., Bur. Public Roads, Jan. 1921), Vol. 3, No. 33. Based on 51 plants representing 40.6 per cent. of total industry production.
[b] B. H. Topkis, "Labor Requirements in Cement Production," *Monthly Labor Review* (U. S. Dept. Labor, Bur. Labor Statistics, March 1936). Based on 102 plants representing 74.8 per cent of total industry production.
[c] Includes crushing.
[d] Includes yard, shop, and repair gang.
[e] Includes mill overhead, superintendents, watchmen, and miscellaneous labor.

TABLE V.—DISTRIBUTION OF SALES OF CEMENT-MAKING MACHINERY BY TYPE OF EQUIPMENT, 1920-36 *a*

Period	Total	Percentage		Index of Sales (1920 to 1924-100)	
		Major Operating Units [b]	Auxiliaries [c]	Major Operating Units [b]	Auxiliaries [c]
1920-36	$9,410,031				
1920-24	2,506,417	90.4	9.6	100.0	100.0
1925-29	4,734,772	76.4	23.6	160.0	463.0
1930-36	2,168,842	59.7	40.3	57.0	362.0

[a] W.P.A. National Research Project.
[b] Crushers, grinders and kilns (sales of 5 companies).
[c] Coolers, driers, chain systems, clinker conveyors, air-separators, kiln extensions, and dust-collectors (sales of 4 companies).

station efficiency, most of the techniques employed to save fuel were developed about the kiln; for the kiln consumes up to 90 per cent. of the total fuel requirements in plants purchasing electric energy or using waste heat boilers, and more than 60 per cent. in those which generate their own power from separately fired boilers. The kiln is also the source of the largest heat losses. Heat-balance calculations indicate that approximately 70 per cent. of the heat input is wasted through incomplete combustion or through being carried away by clinker or stack gases. Two methods have been most generally employed in order to utilize potentially available heat and thus reduce the quantity of fuel necessary to produce a barrel of cement. One of these methods was the installation of waste-heat boilers and the other the use of heat recuperators, filters and other auxiliary equipment.

According to the available data, only four plants were using waste-heat boilers in 1916 as compared with 58 plants which had this type of equipment in 1931. By utilizing energy which would otherwise be wasted waste-heat boilers can be employed to generate power. In some plants the introduction of these boilers has reduced the total fuel requirements by as much as 50 per cent. Medium-sized kilns of 120 to 199 feet in length have been found, according to our analysis, to be most popular for using waste-heat boilers; nearly 80 per cent. of the total installations being attached to kilns of this size.

Another important development which has resulted in improved fuel efficiency was the use of superior draft indicators, pyrometers, flue-gas analyzers, and other control mechanisms. Radiation losses have been also reduced primarily through the use of improved insulating materials.

In the wet-process plants the slurry filters which reduce the moisture in the kiln feed were an important type of equipment contributing to the improvement of fuel efficiency. Chain systems, enlarged calcination zones, and various types of heat recuperators also contribute to fuel economy. One concern reported 63 chain-system installations between 1926 and 1936, while three other companies indicated that 55 rotary coolers were sold to the cement industry between 1921 and 1936 and at least 18 recuperators of the conveyor type were installed during the period 1931 to 1934.

Types of Capital Investment.—The purposes for which expenditures are made have changed markedly since 1929. During the expansion period of the industry new plants required large capital outlays for basic production equipment. Census data show that between 1923 and 1929, from $3,500,000 to $4,500,000 was expended yearly for the purchase of cement-making machinery. With the exception of 1937, when $2,060,000 was invested in cement machinery, the yearly expenditures since 1929 were much below $2,000,000. During the 1930's emphasis was placed primarily on the purchase of auxiliary equipment, whose function was to reduce production costs and improve quality usually without large investment. We have mentioned that auxiliaries to the kiln were widely introduced. According to the records of two companies manufacturing a complete line of burning equipment, auxiliaries accounted for about 40 per cent. of the total sales during the period 1925 to 1929 as compared with 55 per cent. for the years 1930 to 1936.

This is further illustrated by an analysis of the equipment sales of six cement-machinery producers given in Table V. A breakdown of these sales into major operating units and auxiliaries showed that more than 90 per cent. were of the former type during the period 1920 to 1924 and less than 60 per cent. during the period 1930 to 1936. Moreover, while the sales of major operating units dropped to almost half between these two periods, those of auxiliaries increased more than 3½ times.

German Cement *(from page 38)*

ciation 44.2 per cent., while producers comprising the Metallurgical Cement Assn. have a quota of 7.2 per cent. Plants in Austria and Sudetenland are being integrated into the German cartel system. In fact. Austrian producers were already in cartel relations with producers in southern Germany prior to the Anschluss.

The German industry also maintains coöperative trade relations with producers in most European producing countries by means of domestic market protective agreements giving producers priority in their own domestic markets to avoid harmful price wars that have broken out in foreign markets at various times in the past.

German domestic prices for standard cement, which are established by the cartel organizations under governmental control, have been stable since November 1, 1936, when the German government intervened in the trade and required an average price reduction of 5 per cent. Domestic prices had already been reduced, twice in 1934 and once early in 1935. However, beyond the established prices, producers are required to make special price reductions for very large orders, especially if for government account.

Despite the repeated reductions, prices of cement in Germany remain considerably above those in the international trade. Effective January, 1939, the Commissar for Price Control instituted a reduction of 50 per cent. in the supplement charged by the cartels for special high-quality cement above the price of ordinary standard cement. Prior to the cut this price supplement amounted to between 6.00 and 7.00 marks per metric ton. Since special high-quality cement accounts for 12 to 14 per cent. of the national cement trade, the cut in price supplement will represent a loss in income to cement manufacturers of about 7,000,000 marks annually, part of which, however, may be offset by increased sales of the type of cement reduced in price.

Notwithstanding the immense gains already recorded in Germany's cement consumption in recent years, resulting from acceleration of the national economy, increased construction of concrete motor highways, fortifications, houses and buildings of all kinds, and public works, it is expected that strong national demand will continue over an indefinite period of years.

Germany's foreign trade in cement and exports gained steadily from 1933 to 1937, being valued at from 3,900,000 marks to almost 11,500,000 marks. However, in 1938, for the first time, the upward curve of exports was broken, the value of the outgoing trade dropping to 9,935,000 marks. Export contraction was due to a combination of factors, including development of new production in foreign countries, which lessened their dependence upon imported cement; the general slackening of world economy, especially in raw material-supplying countries, the less successful promotion of Germany's policy of bilateral or compensation foreign trade, which provided for payment of Germany's imports of raw materials in the form of exports of German manufactures and, finally, the complete utilization of German cement-production capacity in the second half of 1938, which reduced the amount of cement available for export and lessened pressure on producers to augment exports as a means of utilizing capacity to maximum levels.

It is said that, notwithstanding the strong domestic demand for cement, German cement manufacturers, under the stimulus of the Government, are taking measures for insuring the allotment of an adequate portion of their output for exportation so that they will maintain their position in the international trade and contribute their share to Germany's receipts of foreign exchange, so urgently needed for increasing imports, and thus lessening the national shortage of vital raw materials and foodstuffs.

MORE USES FOR BENTONITE REVEALED

BENTONITE, the astonishingly versatile superfine clay formed by the weathering of the wind-blown ash from volcanoes, continues to find wider and more diversified uses. Domestic output, as reported by producers to the Bureau of Mines, was 192,183 short tons valued at $1,373,182 in 1938, compared with 194,768 tons worth $1,500,758 in 1937. No longer than a dozen years ago, the output of this extraordinary material was almost negligible.

In outward appearance bentonite is ordinary mud. But as far back as the days of the western pioneers it was known to be different. The early settlers are said to have greased the axles of their wagons with it, and the Indians used it as soap. At one time the name, which was derived from Fort Benton shales of the upper Missouri Valley, was applied solely to a specific type of clay known to occur only in the vicinity of the Black Hills of eastern Wyoming and western South Dakota. Later, however, all clays descended from volcanic ash and comprising chiefly the minerals montmorillonite or beidellite, or a combination of both, were classed as bentonites. This definition, however, is an invention of petrographers, and for practical purposes it is necessary to subdivide bentonite into two main types, depending upon relative water adsorption: (1) Those that swell enormously with wetting, and (2) those that swell no more than ordinary plastic clays. Characteristic of Type 1 are the original Black Hills bentonites, although scattered deposits in Western Wyoming, Utah, and Nevada, as well as certain deposits in California, are similar in composition and properties. Most of the bentonite in California, however, is Type 2, and the large bodies of bentonite in Texas, Arkansas, Mississippi, Kentucky, and Tennessee are definitely nonswelling and relatively nonsuspendible, as are numerous smaller deposits reported in other states.

The uses of the two types of bentonite are quite different. The subbentonites, or Type 2, are widely used for oil-well drilling mud, and most of the remainder is acid-treated and made into activated earths for bleaching oils or fats. In oil-well drilling bentonite and sometimes other finely-divided clays are compounded in the mud fluid that is pumped down the drill pipe to flush away the cuttings and bring them to the surface through the outer casing. However, bentonite also may be employed to seal the walls of the hole and (especially when weighted with pulverized barite, hematite, or other heavy mineral powders) to prevent gas pressure from blowing out the hole. Large quantities of Type 1 bentonite are consumed by foundries for rejuvenating molding sand and as a core wash, also in various industries as a binder. Medicinal, cosmetic, and pharmaceutical preparations of various sorts utilize bentonite as an inert vehicle. It is employed to stop seepage through and beneath dams and to plug up leaks generally. It is a standard suspending, spreading, and adhesive agent in horticultural sprays and insecticides. Other established uses are: For emulsifying asphalts and other water immiscibles; as an admixture in concrete to improve workability and flow and to prevent segregation; in dewatering wood pulp to inhibit gumming of screens; to gelatinize wet-mash poultry foods; for clarifying wines; and as a suspending, thickening, and paste-forming agent in a wide variety of products and processes. Bentonite additions to concrete make it tough so that it can be used for resurfacing floors including feather-edge repairs of worn spots. Another interesting new use is for Wyoming bentonite roofing, a covering of pure bentonite which is claimed to afford complete protection against water, fire, and hail. It seems paradoxical to use mud to make things clean yet bentonite is used to wash textiles and to make glassware sparkle.

Possibly the most interesting development during 1938 was the discovery announced by Dr. Ernst A. Hauser, Massachusetts Institute of Technology chemistry professor, that bentonite films, properly processed, may afford a successful substitute for mica in various important uses. The new product, which may come on the market in at least a small way during 1939, has been called "Alsifilm," emphasizing its hydrous-aluminum-silicate composition. Possibly the first important commercial outlet will be as insulating tapes for wrapping wires and telephone cables. It is claimed that these films are fireproof, water-proof, chemically inert, unaffected by mold, unattractive to insects, transparent, flexible, and fairly tough and that they can be employed for a variety of uses where their excellent dielectric properties are not needed. They are said to take ink readily, hence may be used for permanent documents. It is claimed also that they can be made of any desired thickness—like built-up mica or sheets of paper glued together, only without needing any additional binder, therefore they may be used to line food or beverage containers, and to wrap butter, tobacco, cigarettes, and other perishable or oily products. Ordinarily flexible or even crease-proof, the material may be modified in appearance and properties by incorporating various pigments and fillers.

Dr. Hauser explains the formation of these films as due to the attachment of colloidal clay particles end to end in strings or tiny filaments that mat like organic fibers do in the manufacture of ordinary paper or felt. Although produced experimentally at first in an ultra-centrifuge, the films were later manufactured by various methods. At the moment extrusion of the moist jelly seems the most practical method of commercial production because it can be embodied readily in a continuous process whereby Doctor Hauser believes the material probably can be manufactured at a cost of only a few cents a pound. The hardening of the films to make them impervious to liquids is a separate treatment about which very little has been published. In addition to various types of bentonite, other sources of hydrous aluminum silicates have been utilized experimentally. The product from ordinary Wyoming bentonite is not colorless; it looks like oiled paper. But by using a white bentonite, low in iron, the product can be made almost perfectly transparent. Under the cooperative agreement between the Massachusetts Institute of Technology and the Research Corp., Boston, Mass., the latter undertakes the patent protection and commercial development under a policy of making the discovery as widely available as possible. Profits from all the various enterprises conducted by the Research Corp. are reinvested in research.

Consumption of bentonite in foreign countries has not kept pace with that in the United States, owing to its high price abroad. Domestic bentonite has been exported all over the world, though only in rather small quantities. Large scattered bodies of bentonite have been reported in Germany, but German bentonite differs greatly in many of its physical properties from the American bentonites, because it contains calcium as the exchangeable base instead of sodium; some German

clays, however, are being treated artificially so as to exchange the calcium for sodium. European interest has been stimulated recently by the discovery of several new deposits. Russia is said to have large deposits of bentonite, and Italy has opened up what was reported to be an important group of deposits on the island of Ponza, one of the Pontine group off the west coast between Rome and Naples. Samples of this new Italian material are of excellent quality and are of the swelling type though differing from Wyoming bentonite in that they are virtually white. Trial shipments have been made to the United States and already the Italians have used it in steel molding sands. Several important deposits have been found in the western provinces of Canada, and in 1938 the Canadians output jumped to 1,136 tons from 163 tons in 1937. Occurrences have been reported also in Japan, British India, France, Mexico, China, and New Zealand.

Bentonite prices have remained nominally $8 a ton in bulk and $10 in bags for the crude clay (dried and crushed) f.o.b. Wyoming mines, whereas selected airfloated material is quoted at $25 a ton at Chicago. As reported to the Bureau of Mines, crude bentonite ranges in price from $4 to $8 a ton according to quality and locality. The milled clay generally sells in South Dakota at $7.50 to $8 a ton f.o.b. cars and in other parts of the country material prepared for oil-well drilling ranges in price upward to $20. Very little bentonite has been imported in the United States. However, under the reciprocal trade agreement with Canada, effective January 1, 1939, the tariff duties on imports have been halved; the present rates are 75c. a long ton on raw clay and $1.62½ on the "wrought or manufactured" clay.

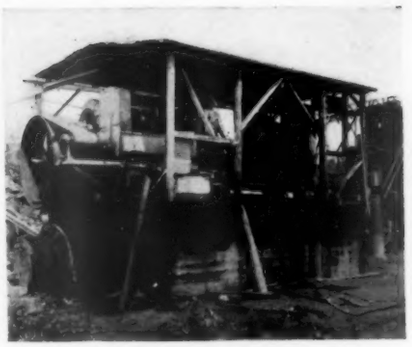
Diesel Powers Scraper on Meramec River

Because of the silt and mud in the Mississippi River near St. Louis, sand-and-gravel operators in this section must turn their efforts to the smaller rivers draining into it. One of these, the Meramec River in St. Louis County, is the source of excellent material.

For nine years the Worthington Material Co. has dredged this river with a drag-line and it is said that in the last three years it produced more than one-third of all the sand and gravel used in St. Louis. Because of its fine quality, a great deal of the material is shipped to construction jobs in Iowa and other surrounding states.

The set-up is simplicity itself. At right angles to and about 100 feet from the river, a platform about 6 feet high has been built, on which two engines are mounted. Each of these engines drives a Sauerman Bros. hoist. A cable for each of the two scrapers used runs from one drum of the hoist, over an elevated pulley about 50 feet in front of it, and down to the front end of the bucket. Another line attached to the back of the bucket extends across the river, over a pulley, back across the river again, over another elevated pulley, and then down to the opposite rotating drum of the hoists.

The scrapers are loaded by being pulled across the river bottom. Upon reaching the shore, they are pulled up an incline to a point almost below the level of the elevated pulleys. Here they are dumped through a screen on a conveyor belt which carries the material up to the screens. The hoist is then reversed and the bucket pulled back across the river. The graded material is trucked to the storage piles. Orders



Diesel-engine drive of one of the scrapers.

are delivered with a fleet of 12 dump trucks.

The sand and gravel removed by the buckets is replenished, from upstream, by the river. For this reason the plant's operation during a few summer months may be intermittent because of low water.

The company has used all types of power—steam engines, gasoline engines, and Diesel engines in the nine years it has operated there. Recently it installed a Model HP-600 Cummins Diesel to power one of the scrapers.

The installation of the Diesel engine provides a "natural" for a comparison with the operating characteristics of gasoline engines. Both are mounted on the same stand, both are doing identically the same work. Both have the same bore, stroke and horsepower ratings.

Soon after the installation, it was was found that the Diesel would pull a loaded 2½-cu.yd. bucket across the river faster than the gasoline engine could pull its 1½-cu.yd. bucket. Thus the Diesel-powered drag-line produces 60 per cent. more material than the gasoline-powered bucket. Both engines are run about 9 hours per day. Fuel consumption of the Diesel averages from 15 to 18 gallons, as compared with the gasoline engine's consumption of about 30 gallons. Of course, the Diesel gives additional savings because of the lower cost of the fuel. This particular make of Diesel can be operated successfully with a wide range of low-cost fuel oils—so that any grade of good furnace oil can be used.

E. M. Worthington, president of the company, is enthusiastic about the Diesel because one of his major investments and costs of the operation is power. Commenting on engines, Mr. Worthington said: "In this type of work you need plenty of power, especially power that is flexible. The loads on the drag-lines are intermittent . . . the power may run for only ten seconds, when you might have to cut it off quick and pick it up again just as quickly. This Diesel power is the most satisfactory and efficient I have ever used."

Meramec River plant of the Worthington Material Co. Drag-line scraper in foreground.

Personal Mention

JOHN G. MUNSON has been elected vice-president, raw materials, United States Steel Corporation of Delaware. He succeeds THOMAS MOSES, who retired on August 18, upon reaching the corporation's retirement age of 70 and who will continue in a consulting capacity. Mr. Munson has been president of the Michigan Limestone & Chemical Company since 1928 with which, as operating manager, he began in 1919 his connection with United States Steel subsidiaries.

O. H. SEEGER has been appointed sales and service engineer at Columbus, Ohio, for the Southwestern Portland Cement Company to succeed FLOYD F. GREEN, who resigned to devote his time to his campaign for mayor.

HERBERT P. WILLIAMS has been granted a war department permit to dredge sand and gravel from the Missouri River at Chamois, Missouri. He was formerly chief engineer for the Boonville Sand & Gravel Company, Boonville, Missouri.

WILLIAM C. MCBURNEY, formerly superintendent of the Yuba River Sand Company, Marysville, California, has been made general manager, succeeding the late A. L. BROWNLEE.

G. W. BENNETT, mining engineer associated for the past 16 years with Symons Brothers Company, has joined the Birdsboro-Buchanan crusher division of the Birdsboro Steel Foundry & Machine Company.

DENN M. BURGESS, general manager of R. G. LeTourneau, Inc. for the past year, has, in addition, been recently elevated to the position of vice-president. In connection with his new duties Mr. Burgess sailed late in August for a survey of the export field in France and England.

H. V. HULEGUARD has been appointed general manager of the Whitcomb Locomotive Company, at Rochelle, Illinois, where sales and engineering activities are now concentrated.

C. T. Price has been named vice-president and general manager of Compressed Industrial Gases, Inc., Chicago.

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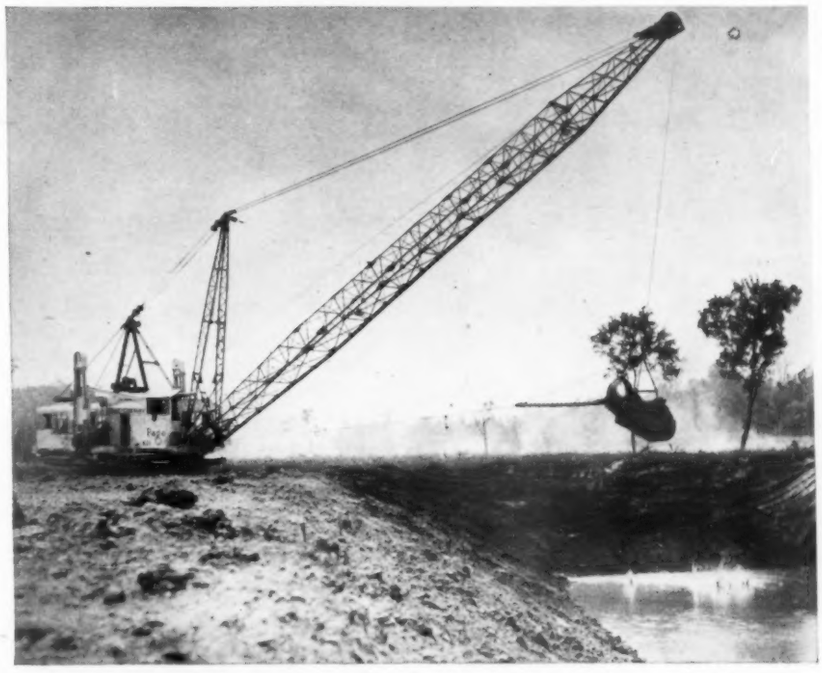

Machine illustrated, Page Walker with 125 foot boom, 6½ cubic yard light-weight bucket. Used by McWilliams Dredging Corporation, digging channel near Earle, Ark.

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HENRY ROSASCO, 64, quarry foreman at the Sonora, California, plant of the United States Lime Products Corporation, died a short time ago. Death was caused by a pulmonary hemorrhage.

WALTER J. ELAM, 72, founder of the Elam Sand & Gravel Company, Rochester, New York, died recently after a six-weeks' illness.

EDWIN W. RUCKSTUHL, 46, president of Willey & Ruckstuhl, sand-and-gravel producers at Cincinnati, is dead after an illness of a year.

B. COWDEN, secretary-treasurer of the Southern States Portland Cement Company, Rockmart, Georgia, died recently at an Atlanta hospital. He had been connected with the company for 35 years and was born in Piedmont, Alabama, January 26, 1863.

K. H. WINTHER, superintendent of the plant of the National Portland Cement Company at Brodhead, Pennsylvania, died of an attack of influenza while visiting in Denmark in August. He was 42 years old. Before joining the company he spent 15 years with F. L. Smidth & Company as a cement-plant engineer.

Labor Decisions

Injunction

Fur Workers Union, Local No. 72, et al. v. Fur Workers Union, No. 21238, et al., decided by the U. S. Court of Appeals for the District of Columbia, March 27, 1939 (petition for rehearing denied May 5, 1939); reported at 105 Fed. (2d) 1. All of the fur workers employed by a Washington retail clothier, except two who discontinued work and joined another union, belonged to a union with which the employer entered into a written agreement. The other union was picketing the place of business, but was restrained from the picketing by an injunction issued by the District Court for the District of Columbia, upon a finding that unlawful acts had been committed and that no "labor dispute" was involved. This judgment is reversed by the higher court, with instructions to dissolve the injunction.

The Court of Appeals holds that a "labor dispute" did exist; that the district court did not make all the findings required under the Norris-La Guardia Act and consequently the injunction was forbidden by that act; that the Federal courts have no power under the National Labor Relations Act or the Norris-La Guardia Act to determine what is the appropriate and lawfully selected bargaining unit for employees (this determination may only be made by the National Labor Relations Board), so that the district court had no jurisdiction.

Company Union

National Labor Relations Board v. Stackpole Carbon Co., decided by the U. S. Circuit Court of Appeals, Third Circuit, May 12, 1939 (opinion amended June 12, 1939; rehearing denied June 30, 1939); reported at 105 Fed. (2d) 167. The employer in this action is a manufacturer of carbon products and radio parts. It purchases approximately two-thirds of its raw materials from without the state and sells over 50 per cent. of its manufactured products to persons outside the state; its business constitutes approximately 10 per cent. of the total carbon-products business and approximately 15 per cent. of the radio parts business of the country; it is, consequently, held to be subject to the National Labor Relations Act. This case is upon a petition filed by the National Labor Relations Board praying for enforcement of an order entered against the company, ordering it to cease restraining or coercing its employees from exercising their rights of self-organization or of collective bargaining and to set aside a contract with an employees' union which the board found to be a company-dominated union. Upon a review of the testimony the court finds that the company had interfered with the employees' right of self-organization, and decrees enforcement of the board's order, with certain modifications of parts.

Interstate Commerce

National Labor Relations Board v. Colten, decided by the U. S. Circuit Court of Appeals, Sixth Circuit, June 28, 1939; reported at 105 Fed. (2d) 179. In this suit enforcement is asked, and granted, of an order of the National Labor Relations Board requiring the respondent employer to cease discouraging membership in the Amalgamated Clothing Workers of America or other labor organization of its employees, and from dominating, interfering with or otherwise supporting an employees' association, and to reinstate an employee alleged to have been discharged for inefficiency but found to have been discharged for union activities. It also requires the company to bargain with the Almagamated as the exclusive representative of the employees.

The jurisdiction of the board was challenged on the ground that the company was not engaged in interstate commerce. The court finds, however, that approximately 95 per cent. of the total purchases of raw materials and sales of finished products moved to and from the plant in interstate commerce. "In the light of the expanding concept of interstate commerce, and of circumstances under which the impact of industrial strife burdens and obstructs such commerce, it is now idle to renew assault already repeatedly repelled upon the jurisdiction of the board," says the court.

Unemployment

In re Sadowski, decided by the New York Supreme Court, Appellate Division, Third Department, July 11, 1939; reported at 13 N. Y. S. (2d) 553. This was an appeal from and affirms, a decision of the New York Unemployment Insurance Appeal Board. The employee concerned was without work, during the period of a strike, for six weeks and five days, and contended that she was eligible for unemployment benefits under Article 18 of the New York Labor Law after the expiration of the normal waiting period of three weeks as provided in subdivision 1 of Section 504 of the law. The board and the court hold, however, that the applicable waiting period was ten weeks under Paragraph (b), Subdivision 2 of

Section 504, applicable when the employee's loss of employment was because of a strike, lock-out or other industrial controversy in the establishment. Under that statute, says the court, it is immaterial whether the claimant was an actual striker or whether she was unable to work "because of a strike."

Officer

People v. Grass, decided by the New York Supreme Court, Appellate Division, First Department, May 5, 1939. The complaining witnesses in this case were employees who alleged that they had not been paid "weekly . . . to a day not more than six days prior to the date of such payment," as required by Section 196, Subdivision 2, of the Labor Law, as amended. Contracts in contravention of this provision have been held to be illegal and void. However, the employer in the present case was a corporation as to which an order of liquidation has been granted under Section 77B of the United States Bankruptcy Act, and the defendant named was president of such corporation. The court holds that the president was not personally responsible for the corporation's omission to pay the wages due at the end of each work week, and that he could not be adjudged guilty of the offense.

Occupational Diseases and the Law

Time of Disablement

Renfro v. Pittsburgh Plate Glass Co., decided by the St. Louis (Missouri) Court of Appeals, June 28, 1939; reported at 130 S. W. (2d) 165. This case involved a workmen's compensation award for disablement from silicosis, contracted during employment in the "pot house" of the respondent company's plant. On December 7, 1935, the employee was transferred to other work, where there was no exposure to dust but where, also, the wages were less. The employee ceased work on January 3, 1937, and received an award for disablement from silicosis. The rate of compensation, however, was fixed not on the basis of the workman's earnings for the year preceding January 4, 1937, but on his earnings for the year preceding the transfer from the pot house—this on the theory that examinations by the company's physicians revealed that the employee was disabled from silicosis and that the company transferred him to a less remunerative employment with the object of reducing the eventual compensation. The court reverses the award, holding that this finding is inconsistent with the finding that disablement dated from

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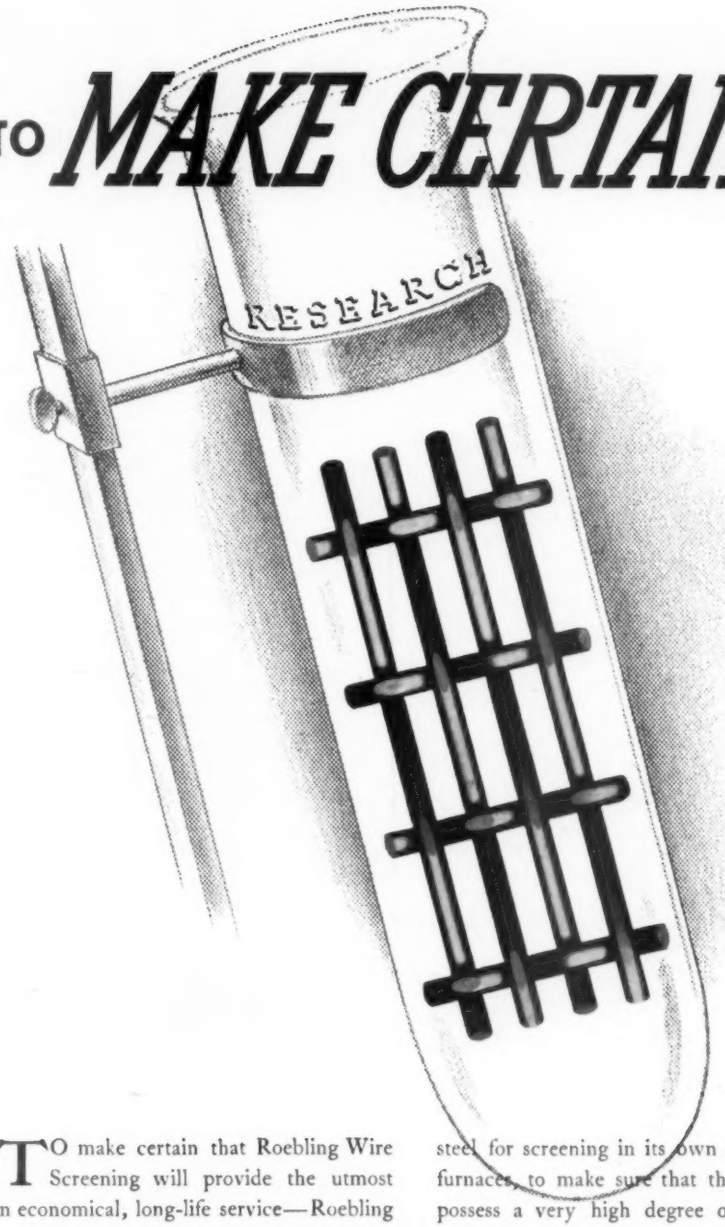

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the termination of employment, and that the evidence does not support the belief that the company had pursued such a "cruel and heartless" policy; that, rather, the transfer from the exposure dust to a less remunerative employment was a consequence of a lack of work and economic retrenchment. Under such circumstances, it is held that compensation should be based on the earnings during the year preceding actual disablement and termination of work.

Silicosis

Fitzgerald v. Fisher Body St. Louis Co., Etc., decided by the Kansas City Court of Appeals, Missouri, May 29, 1939 (rehearing denied July 3, 1939); reported at 130 S. W. (2d) 975. The employee involved in this case worked near a spraying booth where automobile bodies were sprayed with paint by means of pressure guns. He was not furnished a respirator and breathed the paint spray and dust, which (when analyzed in 1934) contained fine particles of silica, iron oxide, aluminum oxide, calcium carbonate and basic lead carbonate. After a period of ill health, the employee collapsed at work, and subsequently died of (according to medical testimony) tuberculosis induced by silicosis. An award of compensation to the widow is affirmed by the court.

The court holds that "in the absence of any provision to the effect that an occupational disease under the [Workmen's Compensation Act, as amended] is a disease 'incident' or 'peculiar' to the work it is reasonable to say the legislature intended that an occupational disease, within the meaning of the compensation law, is a disease caused or directly resulting from working conditions. . . . Any other construction would allow an employer to maintain working conditions detrimental to the health of his employees, deprive the latter of any remedy for the wrong and thus thwart the very purpose of the occupational-disease amendment."

Pennsylvania Statute

Rich Hill Coal Co. et al. v. Bashore, decided by the Supreme Court of Pennsylvania March 27, 1939, and on petition for reargument April 15, 1939; reported at 334 Pa. 440, 7 alt. (2d) 302. This is a sweeping decision declaring invalid and unconstitutional various provisions of the Pennsylvania Occupational Disease Compensation Act of July 2, 1937*, and other 1937 and 1938 supplements and amendments to the Pennsylvania Workmen's Compensation Act of 1915. The provisions held to be unconstitutional and void are:

(1) The provision, Sec. 203, Act No. 323 of June 4, 1937, P.L. 1552, which makes an employer liable to the employees of subcontractors for injuries to such employees in the course of employment whether such injuries occurred upon premises occupied or controlled by the employer or not;

(2) That part of Par. B of Sec. 301 of the same act which provides that violation of "any law or rule or regulation of the business or industry or a positive order of the employer at the time of the injury" shall not affect the employee's "right to receive compensation";

(3) Section 8 of Act No. 552, the Occupational Disease Compensation Act of July 2, 1937, P.L. 2714, first sentence, provided that as against an employer who has not elected to be bound by the provisions of Article III of the Workmen's Compensation Act, "proof on the part of the employee that he had been subjected to a physical examination by such employer and that he had been discharged by such employer within one year after such examination, or proof of discharge by such employer and the further fact that the employee was unable to secure other employment within six months of the date of such discharge by reason of the presence of an occupational disease in any stage, shall be *prima facie* evidence of negligence on the part of such employer";

(4) Subsection D of Section 8 of the same act, denying to such employer the defense "that the employee was exposed to the hazard of such disease in any other employment more than two years prior to the date of such action";

(5) The major portions of the Act (No. 20) of September 29, 1938, P.L. 52, specifically Section 201.1 and Subsections A and B next following that section, which provide that "when injury results to an employee in the course of his employment, it shall be presumed that the employer's negligence caused said injury", and that "when an employee sustains an injury in the course of his employment, declarations, remarks and utterances made by the injured employee within twelve hours after the injury was sustained shall be admissible as competent evidence";

(6) That provision of Section 437 of Act No. 323 which authorizes a lay member of a labor union to represent a claimant in litigating his claim;

(7) Section 502 of Act No. 323, in permitting the Department of Labor and Industry to assess a charge upon "all employers" of the Commonwealth to pay for the cost of administering the Workmen's Compensation system and

* [The 1937 act referred to was repealed and replaced by the Occupational Disease Act, No. 284, of June 21, 1939, effective October 1, 1939.]

the Rehabilitation Act of July 18, 1919; and

(8) Section 321 of the Act of 1937, which seeks to compel employers or their insurance carriers to make a payment to the Commonwealth in the amount of $1,500 for the death of any employee leaving no dependents, if such employee's death would have been compensable had he been survived by dependents.

With the exception of the provisions specified, the Workmen's Compensation Acts of June 4, 1937, P.L. 1552 (Act No. 323), July 2, 1937, P.L. 2714 (Act No. 552) and September 29, 1938, P.L. 52 (Act No. 20) are not adjudged to be unconstitutional, but the questions as to the reasonableness of the compensation prescribed by them and as to the validity otherwise of their several provisions are left open for future judicial determination in appropriate proceedings in the lower court. The case is remitted to the lower court for such further proceedings, particularly for the development of facts on the question of the reasonableness of the compensation provided.

It is pointed out in the court's opinion that no provision of any compensation act had ever before been held unconstitutional in Pennsylvania.

Cause of Tuberculosis

American Rolling Mill Co. v. Adkins, decided by the Court of Appeals of Kentucky, June 16, 1939; reported at 130 S.W. (2d) 69. The employee (appellee) in this case received an award of compensation for total permanent disability from inhaling gas while working at a pickler, which (it was contended) gave off noxious gases which affected his lungs and caused him to develop tuberculosis. No traumatic injury was shown. The medical evidence was to the effect that the irritation and inflammation of the employee's lungs and of the mucous membrane of his nose and mouth were caused by the inhalation of the gas and made the ground fertile for the tubercle bacilli; but the doctors could not say that the inhalation of the gas caused the employee's tubercular condition. The award of the Workmen's Compensation Board is, accordingly, set aside, in accordance with *American Rolling Mill Co. v. Pack,* 278 Ky. 175, 128 S.W. (2d) 187, involving very similar facts.

Morris Machine Works of Baldwinsville, New York, announces the appointment of M. H. Morris as president, J. L. Lonergan as vice-president and general manager, A. G. Forssell as second vice-president, and the reappointment of R. S. Mercer as secretary and treasurer. All have been associated with the company for many years.

Traffic News Digest

RECENT I.C.C. DECISIONS

Crushed Stone.—In response to fourth section application No. 16,057, carriers in the south, who were parties to the case entitled "Rates from, to and between points in southern territory" in which decisions have been recorded in 191 I.C.C. 507, 201 I.C.C. 18 and 209 I.C.C. 216, have been granted relief from the long-and-short-haul clause of section 4 on crushed stone, crushed marble, crushed, ground or pulverized slate and related articles, in carloads, between points in southern territory and between points in southern territory on the one hand and points in central territory on the other as described in the application. Rates to be applied are those set forth in the decisions referred to above using the short line rate. The rates will not apply to circuitous lines or routes over which relief has not been granted on class rates. I.C.C. F.S.O. No. 13,521.

Sand and Gravel.—In response to fourth section application No. 17,596, carriers who are parties to Miller's I.C.C. 200 have been authorized to establish and maintain rates on sand, gravel and related articles between points in southern territory as described in Southern Class Rate Investigation, 100 I.C.C. 513 from points in Illinois, East St. Louis and south thereof, to destinations in Mississippi valley territory; and from points in southern territory and Virginia points in trunk line territory, except between points both of which are in Virginia, without observing the long-and-short haul clause of section 4. Relief is subject to the 33⅓, 50 and 70 per cent. circuity limitation provisions. This limitation, however, will not apply in the absence of specific routing where a rule is used showing rates and routes of maximum length over which rates will apply. I.C.C. F.S.O. No. 13,514, sand and gravel in southern territory.

Interstate Commerce.—A complete definition of just what is included in the term interstate commerce has been one of the problems confronting the Commissison from the time the first interstate commerce act was made effective establishing an Interstate Commerce Commission. Placing motor carriers under the jurisdiction of the Commission has added new problems. A recent decision might affect a number of producers in the nonmetallic minerals industry who are not located on a railroad but who occasionally find it necessary to have their products trucked to a railroad for shipment outside of the state. The case in question involved a motor carrier who is not a common carrier but had a contract for carrying ore and concentrate from mines near Patterson and other points in Idaho to Mackay, Pocatello and Blackfoot, Idaho, for shipments to points beyond the border of that state. When joint rates are in effect for shipment of materials across state lines there is, of course, no question about the shipment being interstate commerce. In this case, however, no joint rates were in effect, the contract carrier merely moving the material to Mackay or the other destinations and turning it over to someone else. In the decision the Commission uses the following language: "The act gives us jurisdiction over 'motor carriers,'

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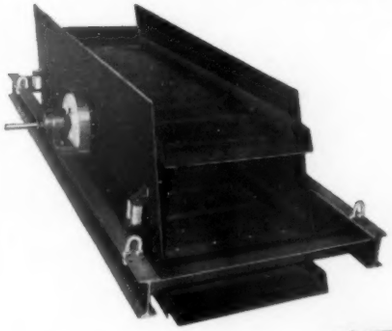

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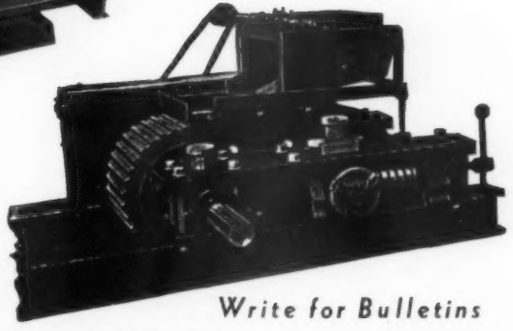

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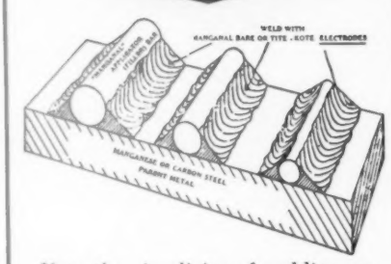

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which term specifically includes both common and contract carriers. In our opinion, it gives us jurisdiction over carriers such as applicant, under the circumstances considered, in clear and unambiguous language. Therefore, we take occasion to state that while we are guided to our conclusions herein by the principles announced in the cited court cases, we are further impelled to such conclusions by what we regard as the unmistakable mandate of Congress as expressed in the act." While the case itself was of very minor importance the question involved made it necessary to go into the matter very thoroughly. This, Chairman Eastman said, occasioned the delay in handing down a decision. The case was referred to the Commission on December 15, 1937, and the decision made public August 25, 1939. The case itself involved an application for common carrier permit for intrastate operation. The carrier contending that he did not need an interstate permit as he was not engaged in interstate commerce. The decision which is quite lengthy calls attention to a number of previous decisions and to cases decided by the supreme court. One which has a very direct bearing on this subject is B. & O. S. W. v. Settle reported in 260 U. S. 166. In this case the supreme court had under consideration a shipment of lumber made from outside the state of Ohio to Madisonville, Ohio. The transportation was accomplished in two movements. The first involved shipment from points in the south of Oakley, Ohio, where the shipper paid the freight charges and took possession of the lumber. In a few days without unloading it it was rebilled to another destination in Ohio. In this case the interstate rate from point of origin to Madisonvi'le, O., was less than the sum of the interstate rates from point of origin to Oakley, O., plus the intrastate rate from Oakley, O., to Madisonville, O. The supreme court held in this case that it was the intention to make interstate shipment from the south to the final destination and that under the circumstances the intention as it was carried out as a matter of law determined the nature of the movement so that the movement from the point of origin to Madisonville was in its entirety in interstate commerce and that the rate app'icable was that from point of origin to Madisonville, Ohio, regardless of the fact that the shipper paid freight charges and rebilled the material at Oakley. In another case reviewed it was decided that on shipments of logs which moved from a destination in one state to another destination in the same state then were floated down the river to a destination in another state, were not in interstate commerce. In this case the logs were unloaded and stored for a time and as such were subject to local taxation. I.C.C. docket No. MC86,768, William E. Rush, common carrier application.

Bureaucracy.—While this case does not directly involve members of the non-metallic minerals industry it well illustrates the fine points involved in interstate commerce law and well illustrates the trouble that may be caused by failure to comply with the instructions of governmental bureaus regardless of whether the party feels that the instructions are legal or illegal. In this case the defendant, named Bowles, bought equipment at a judicial sale. This equipment had been owned by Lennerton, a common carrier by motor vehicle operating under the grandfather clause. In such cases the purchaser is entitled to continue operation and to receive a certificate establishing his right under the grandfather clause. However, in this case there was a dispute between Bowles and the employees of the Bureau of Motor Vehicles as to whether 20 or more vehicles were involved in the transaction. Bowles contended that there were fewer than 20 vehicles involved and the Bureau contended that there were more. In case there are more than 20 vehicles involved it is necessary for the purchaser to file application for permission to make the purchase. Since Bowles contended that there were less than 20 vehicles involved he did not file the necessary application so the Commission through its bureau obtained an injunction forbidding Bowles to operate. He ceased opepration. Then the Commission decided that since he had ceased operation he was not entitled to a certificate under the grandfather clause because of the fact that operations had ceased. The Commission held that Bowles could have continued operation by going to the court and obtaining a restraining order stopping the injunction granted the Commission. The Commission held that cessation of operation was within the control of Bowles since he still had recourse to the court to obtain a restraint against the Commission's injunction. In a dissenting opinion, Commissioner Lee uses the following language: "If ever a man stood 'between the devil and the deep blue sea' I think that man was Bowles. At our instance an injunction against the continuance of his considered interstate operations was outstanding. He had the choice of stopping his operations or going to jail. Therefore, it seems reasonable to conclude that the cessation was within his control.

Bowles was probably a little stubborn in his attitude. People sometimes get that way when they think their rights are being invaded. No doubt it would have saved him a lot of grief if he had filed a section 213 application (to be made when more than twenty vehicles are involved). I would issue to Bowles a certificate covering Lennerton's operations." Whether Bowles bought more or less than 20 vehicles was not disclosed in the decision. I.C.C. docket No. 72,225, Lennerton Motor Transportation, Inc., common carrier application.

NEW COMPLAINT FILED

Fluxing Stone.—Alleging violation of sections 1 and 3 with undue preference alleged for shippers at Martinsburg, W. Va., reasonable rates have been requested on fluxing limestone from Howard Pleasant Gap and Bellefonte, Pa., to destinations in official territory in a complaint filed by Horace B. Garlick of Williamsport, Pa., in I.C.C. docket No. 28,316, Whiterock Quarries, Inc., Bellefonte, Pa. *v.* Pennsylvania *et al.*

TRAFFIC NEWS

Classification Simplification.—Work on simplification of both rail and motor classifications has noted in recent issues of PIT AND QUARRY is continuing. The report of the committee on motor vehicle transportation to the fifty-first annual convention of the National Association of Railroad and Utilities Commissioners in the report on the uniform motor freight classification stated that a special committee had prepared a uniform motor freight classification in which the class ratings were based on weight and volume. It departed from that basic principal only in exceptional cases when necessary to include the effect of other important factors resulting in a higher class rating. Articles were grouped in seven classes as follows: class (a) materials weighing up to 3 pounds per cubic foot; class (1) materials weighing from 3 pounds to 6 pounds per cubic foot; class (2) materials weighing from 6 pounds to 10 pounds; class (3) materials weighing from 10 pounds to 15 pounds; class (4) materials weighing from 15 pounds to 20 pounds; class (5) materials weighing from 20 pounds to 40 pounds; class (6) materials weighing 40 pounds or over per cubic foot. All articles in the classification were arranged alphabetically which eliminated the necessity of an index and made it possible to list 20,000 articles in about 160 pages.

The Traffic Advisory Committee of the Association of American Railroads has announced

a series of hearings to be held on the simplification of the consolidated classification. Hearings have been held or are scheduled to be held as follows: Detroit, September 12; Pittsburgh, September 14; Minneapolis, September 19; Chicago, September 21; Boston, October 3; New York; October 5; Atlanta, October 10; New Orleans, October 12; Dallas, October 17; St. Louis, October 19; Omaha, October 24; Salt Lake City, October 27; Los Angeles, November 1; San Francisco, November 8; Portland, November 14; and Seattle, November 16. Anyone having suggestions to offer upon simplification of the classification is invited to write to A. H. Greenly, Chairman, Traffic Advisory Committee, American Association of Railroads, 310 Chicago Union, Chicago, Ill. The following questions will be the basis for discussion at the hearings and answers to these questions will be received by mail at the above address from anyone who is interested in this subject. The questions are:

What commodities do you ship by rail and by other forms of transportation, both carloads and less?

In what classes do the less-carload shipments by rail fall?

Do you favor reduction in the number of less-carload classes?

Do you favor further unification of ratings in the classification, both carloads and less?

Do you favor elimination of packing requirements, wholly or in part?

To what extent do packing requirements influence movement by other forms of transportation than by rail?

Should packing specifications be shown in a separate section of the classification?

Do you favor a general reduction in carload minimum weights?

Have you any suggestion as to changes in present procedure of the classification committees in consideration of shippers' proposals for changes in classification?

Are you satisfied with the present classification?

Do you favor elimination of specific items, to be covered by general items?

To what extent do you think value should influence ratings?

Do you think there should be any difference in ratings on shelf goods versus bulk goods?

Do you think there should be any change in the manner of indexing, and if so, in what manner?

Do you favor revision of any of the rules, and if so, in what way?

Do you think it would be an improvement to transfer the position of the rules in the classification to follow the ratings?

Do you favor transference of Exceptions to the Classification to the classification, both carloads, and less, and if so, to what extent and upon what basis?

Reconsignment Rule.—The National Industrial Traffic League asked the railroads to lower the minimum for diversion or reconsignment on l.c.l. shipments from 24,000 pounds to 10,000 pounds. The railroads countered with a proposal to reduce the minimum to 15,000 pounds which has been accepted by the League's diversion and reconsignment committee for a trial period. This change will be made in diversion and reconsignment rule 15 (A).

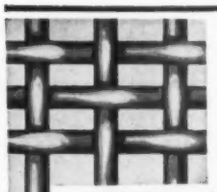
The Brooks Equipment & Manufacturing Company announces the appointment of R. S. (Tommy) Tucker as its general sales manager. Mr. Tucker was formerly vice-president and general manager of the Good Roads Machinery Corporation, of Kennett Square, Pennsylvania.

New Machinery and Supplies

● Crusher

The Allis-Chalmers Manufacturing Company, Milwaukee, builder of various types of gyratory and jaw crushers, has just announced its new Type "R" all-steel reduction crusher. Although working on the gyratory principle, it operates at higher speed than ever used before. It has a crushing stroke selected for high capacity and cubically-shaped product and has been especially designed for handling large tonnages of stone or ore. Its all-steel construction provides great strength, and conserves weight. The No. 322 Type "R" now being marketed is assembled and ready to set on foundations without dismantling on arrival at the plant.

This new crusher is of simple construction, the spider and top shell being cast integral, and readily removable for replacing of its manganese-steel concave ring. Adjustment for taking up wear on this liner and on the special manganese steel mantle is easily accomplished by means of a simple oil-field hydraulic jack, located in the bottom plate of the crusher and which supports the main shaft. This jack arrangement also provides product size adjustment and under normal operation firmly holds the head and shaft in position for maintaining a uniform product. A safety valve



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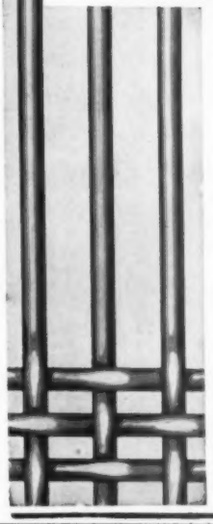

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New all-steel reduction crusher.

feature allows automatic adjustment for tramp iron. The drive is by means of high-speed cut-steel gears located in bottom shell and operated in bath of oil, cooled in an external cooling tank. The counter shaft is driven by flat belt or Texropes from electric motor or engine. New type dust seals keep working parts clean and reduce wear. Bottom plate is of open type to prevent obstruction of crushed material.

• Speedometer

A new Shiftoguide speedometer, which already is proving to be one of the most valuable aids to economical truck operation developed in recent years, has been introduced by the Ford Motor Company as standard equipment on all Ford regular and cab-over-engine trucks, except ¾-ton and 1-ton types.

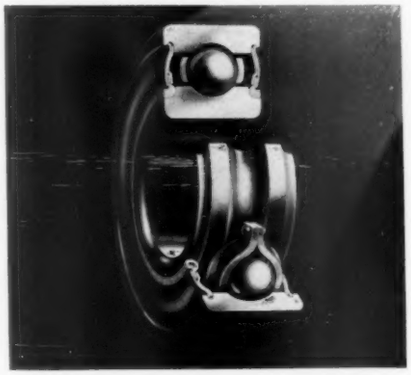
The new instrument does away with guess work in gear shifting, and does virtually everything that a tachometer would do for the truck operator, extensive "on-the-job" tests show. It makes reduced engine wear and improved operating economy possible even for inexperienced operators.

The dial of the Shiftoguide speedometer shows at a glance the correct speed ranges in which the truck should be operated in low, second, third and high gears. As the speedometer pointer crosses the line dividing the different ranges, the operator knows that is the correct time to shift the gears up or down as load and road conditions demand. He doesn't have to rely on experience, instinct or "feel" to get best results from his truck.

The Shiftoguide speedometer is calibrated to show that gears should be shifted as follows when accelerating: Low to second at 6 mi. per hr.; second to third at 12 mi. per hr.; and third to high at 26 mi. per hr. When pulling loads up long grades, the proper speeds for shifting to lower gears are the same as those above, but in the reverse sequence.

• Ball Bearings

A line of sealed ball bearings along entirely new and simple principles has just been developed by SKF Industries, Incorporated, Philadelphia. The seal used in these bearings is one that can be applied to bearings having a standard single row S.A.E. dimension of bore, inner and outer race width, which up to the present time has not been possible except



Ball bearing which employs new type of seal.

through the use of small balls and, consequently, loss of bearing capacity.

This outstanding development has been evolved by departing from the conventional stuffing box type of seal in favor of modern air-cleaner principles sealing against dirt by the felt fibre contact on the polished surfaces of the inner race, and by the utilization of the natural tendency of deflected felt to resume its original flat shape.

Extensive tests have proved that the new seal retains the bearing lubricant and excludes

Latest addition to ready-mixed-concrete plants in Georgia is shown above, recently installed by the Cornell-Young Company of Macon. The plant includes complete facilities for furnishing certified concrete in any quantity to large and small consumers. Equipment includes six Jaeger truck-mixers, a Lorain crane for handling materials, latest type storage, measuring and weighing facilities.

any dust or dirt entry into the bearing itself, yet the sealing action is so light that the friction drag has been greatly reduced.

The bearing is, therefore, suitable over a great range of speed. Even though the bearing is in the standard single-row width, which in itself simplifies design and saves space, an ample lubricant space is provided as is indicated in the photograph. It is available for shafts up to approximately one inch in diameter.

• Truck Tire

Smashing all records for long, trouble-free truck service is the new YKL truck tire, a perfectly balanced, cooler-running, longer-wearing, streamlined unit just announced by the Goodyear Tire & Rubber Company, after a long time in development and exacting road tests.

Streamlined, cool-running truck tire.

Exclusive features of the new YKL are first, that it is made of Rayotwist cord, spun from rayon and is unequalled in heat and fatigue resistance. The tire's tread is new, with deeper non-skid and thicker undertread for longer wear and traction. Tread contact is 12½ per cent. greater because design is flatter, and with tougher rubber compound, tire wear is naturally slower, designers point out.

Center traction, meaning grip in the center of the tread design where it is most needed, and double shoulders aiding slower, more even treadwear are also important points.

Third construction point of interest to truckers in the new YKL is the tire's multiple compounding, providing better distribution of the stresses between body and tread, thus preventing tread separation and insuring greater resilience to repeated blows of the highway at fast speeds.

Shock-impact mountings, as designed by Goodrich, allow the entire belt, idler, and frame to recoil from impact at beet-conveyor loading points. This recoil is absorbed by the movement of rubber in the mounting. Because this rubber is in shear, not in compression, it distorts easily and absorbs impact without damage to the belt cover. Four of the mountings are normally used in each idler frame.

Recent Books

MEDICOLEGAL PHASES OF OCCUPATIONAL DISEASES, by C. O. Sappington, M.D., Dr.P.H. *400 p. Price $2.75 (cloth). Published by Industrial Health Book Company, 540 N. Michigan Avenue, Chicago, Illinois.*

The material of this book has been divided into four parts: (1) Industrial, (2) Insurance, (3) Medical, and (4) Legal, and the relationships of the personnel of each of these divisions are shown throughout the text, indicating the necessity of the business executive, the insurance carrier, the industrial physician, and the lawyer cooperating in the solution of common problems.

The author has presented the material in clear and concise language, indicating the coördination of the extensive and complicated factors in the field of industrial hygiene and occupational diseases. Each part consists of

(Continued on page 64)

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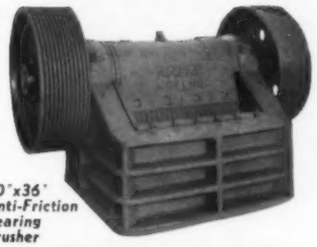

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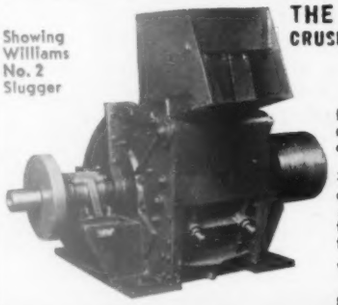

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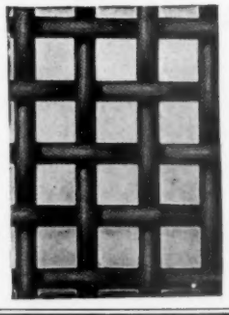

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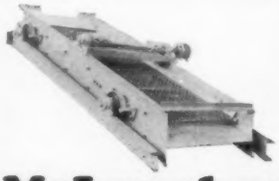

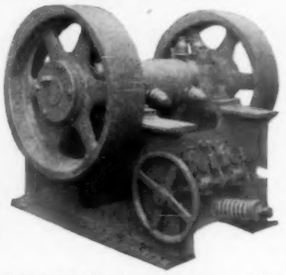

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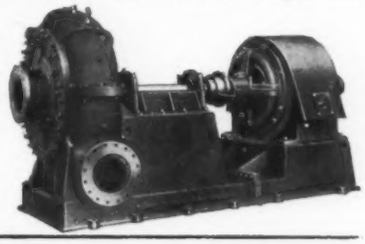

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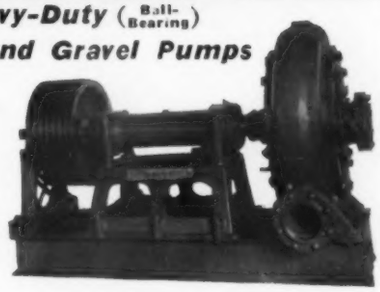

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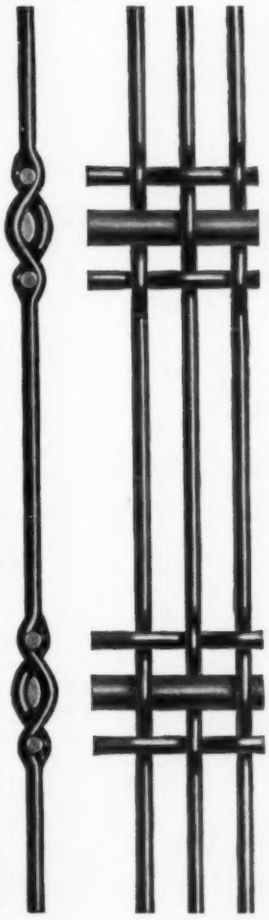

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an introduction, and chapter texts, followed by a summary and list of references for that particular part.

There is an excellent Appendix, including Occupational Record, Abstracts of State Laws, Scheduled Diseases, Abstracts of Legal Decisions, Legislative Suggestions of the American Bar Association, Suggested Schedule Law recommended by the American Public Health Association, and a Digest of Workmen's Compensation Laws by States. Twenty-nine tables illuminate the text to good advantage, as well as illustrations of some of the apparatus used in industrial hygiene activities. The book is especially well indexed.

This volume should have an important place in the executive library of the industrial plant, be it large or small. The subject of occupational diseases is assuming an important place in the plant program, since the economic cost of occupational diseases has been found to be so important. A plant need not have an occupational disease exposure to have an occupational disease claim brought against it. The cost of prevention has been found in many instances to be appreciably less than the cost of defending a single occupational disease claim.

LAW AND CONTEMPORARY PROBLEMS: THE WAGE AND HOUR LAW. *Published by Duke University School of Law, Durham, North Carolina. 165 pp. Price $0.75.*

The Federal Fair Labor Standards Act, more popularly known as the Wage and Hour Law, enters its second year of operation in October of this year and automatically, for those within its scope, a higher minimum wage and a lower maximum work-week goes into effect. Still more workers will be added to the millions already affected by the law—considered by many the most far-reaching in its implications of any since the National Industrial Recovery Act. This 165-page symposium, constituting the Summer, 1939, issue of *Law and Contemporary Problems,* the Duke University Law School quarterly, is devoted to a consideration of the problems, legal, economic and administrative, which are presented by the legislation. Advantage has been taken of the experience thus far had under the Act, but many of the writers have not hesitated to deal with those problems of the future which will arise as the standards of the law become more exacting.

THE ECONOMICS OF CHEMICAL INDUSTRIES. By *Edward H. Hempel, Ph.D., D.C.S. 259 pp. Published by John Wiley & Sons, 440 Fourth Avenue, New York, New York. Price $3.*

In this text the author, research associate in industrial engineering at Columbia University, has attempted broadly to familiarize his readers with the characteristic background and the economics common to the American chemical industries. Its main aim is to demonstrate what has been done so far in chemical economics and describes the dangerous as well as the practical and useful economic policies which must be understood by those dependent on the industry.

As no branch of economics is an exact science and because in real life only a few of the economic decisions which have to be made daily can be based on integrated formulas and complicated charts, such theoretical approach is avoided. Instead, the basic rules and methods have been described so that they can be remembered and put into actual use, modified and adjusted, of course, by good judgment in view of existing details.

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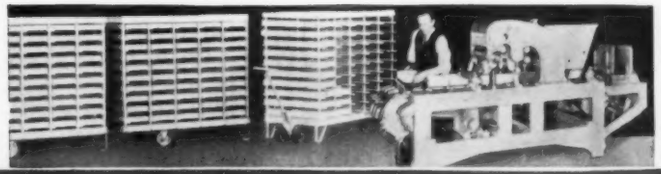

The CONCRETE MANUFACTURER

October, 1939

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Processed Lightweight Aggregates Are Being More Widely Utilized

In recent years processed or manufactured light-weight aggregates have been utilized more widely than heretofore, chiefly in the manufacture of precast concrete units for building construction, to which the light-weight aggregates impart several highly desirable properties, namely, light-weight, heat and sound insulation, low water absorption, fire resistance, and durability. In addition, the blocks serve as ideal plaster or stucco bases, are nailable, and can be channelled or cut easily. Light-weight aggregates are employed to a limited extent also in poured concrete for large industrial and commercial buildings and bridge floors, but as this class of construction has lagged behind general recovery since 1933, the consumption of the aggregates for this purpose probably is well below that during the late 1920's.

Manufactured light-weight aggregates are vesicular materials that have been crushed and sized into two or three grades. Finished concrete work in which light-weight aggregates have been used weighs, roughly, 30 to 40 per cent. less than the usual gravel or crushed stone mixtures. This saving in weight is accomplished with a minimum loss of strength.

Processed aggregates, all of which are manufactured under patents, may be divided into two general groups—expanded shales or clays, and expanded slags. The more important commercially are sold under the trade names of Haydite, Pottsco, Superock, and Waylite. Haydite, the expanded shale aggregates, was introduced shortly before the World War. It is manufactured by heating shale in a rotary kiln to a point between the vitrification and fusion temperatures. Escaping gases form a vesicular material that is cooled, crushed, and sized. Pottsco, Superock, and Waylite are expanded slags made by treating molten slag with water or steam. The first of these to be marketed was Pottsco, in 1928. Units made with these aggregates meet most building-code requirements and are approved as fire retardants by the Underwriters' Laboratories.

Use of the processed lightweight aggregates grew continuously through the late 1920's and was halted only by the rapid decline of building activity from 1929 to 1933. Since 1934 recovery has been marked, and in the past several years producers of these aggregates have entered new, important consuming areas. Prior to 1933, production facilities were located in the Buffalo, Chicago, Cleveland, Kansas City, Pittsburgh, and St. Louis districts. New producing centers, added since that time, are in the Birmingham, San Francisco, and Philadelphia-New York market areas. The building of two processing plants in southeastern Pennsylvania within the past year marks the first attempt of the lightweight aggregates producers to develop actively the large building-material markets in the eastern coastal cities. At present, the Chicago district, in which Haydite, Pottsco, and Waylite are competing, is probably the most important market. Most of the Haydite used in the Chicago area is produced by the Western Brick Company at Danville, Illinois, while Pottsco and Waylite are produced from blast-furnace slag in the great steel mills of the Calumet District in northwestern Indiana.

Improvements in casting machinery and the development of vibration-pressure machines have aided greatly the facility and rate of manufacture of precast standard units and special shapes. Many varieties of precast lightweight building products are now offered on the open market. They include complete lines of masonry and back-up units, building bricks, floor joists, columns, and partition, roof, and floor tiles and slabs. In addition, many specially-shaped units may be cast with lightweight aggregate concrete. Special products of unusual interest are a backing of lightweight aggregate concrete bonded directly to a veneer of natural sandstone, or bonded with an asphaltic mastic to a veneer of structural glass.

Although processed lightweight aggregates are relatively new materials, they already occupy an important position in building construction. Wider utilization of these materials can be predicted safely from the growing recognition of their desirable qualities, the uniformity of grade, adaptations for new building products, and past records of production.

La Fayette Firm Promotes Product by Sponsoring an All-Concrete House

BECAUSE concrete-units producers in many cities have proved that concrete demonstration houses are extremely effective in promoting the sale of concrete products, the Indiana Lock Joint Concrete Pipe Company of La Fayette, Indiana, in coöperation with S. S. Palma, contractor, carried out a successful promotional venture along this line in the summer of 1939. Hundreds of prospects for this type of residence were developed as a result.

After studying a score or more of plans, the builders chose the *Better Homes and Gardens* "Dream Home," a small, well laid out two-bedroom design which was thought especially suitable for the class of buyers it hoped to interest. N. J. Harriman, sales representative of the Indiana Lock Joint Concrete Pipe Company, took care of the promotion, and a series of four or five advertisements appeared weekly in the La Fayette newspapers, tied up with effective publicity in the news columns, telling of the progress being made in the construction of the house, pointing out its fire-safety, low first cost, permanence, high resale value, etc.

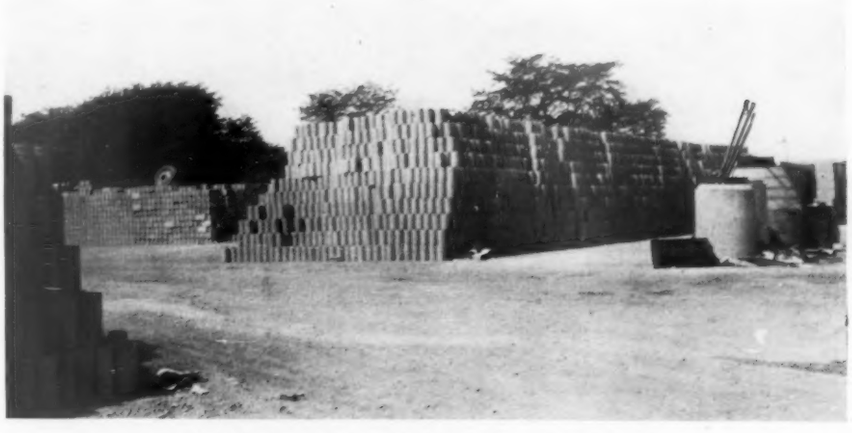
When announcement was made that the house was to be open to the public, two full pages in the *La Fayette Journal and Courier* were devoted exclusively to the house, including the advertisements of all the firms that contributed to its construction. Open house was held for but 1½ days, but in that time 2,500 persons inspected it inside and outside. Cards filled in by the visitors provided the names of hundreds of prospects, and these were personally invited to a special meeting at the Purdue Memorial Union Building a few weeks later. At this gathering Fred R. McComb, housing consultant at Indianapolis for the Portland Cement Association, was the principal speaker and his talk was made the more interesting through the projection of many color photographs of a variety of concrete houses, completed and under construction.

After the brief public showing scores of other visitors were shown through the house by appointment, no effort having been made to sell the house, because Mr. Harriman had al-

(Continued on page 69)

The all-concrete house shortly after it was completed.

Plant of the Indiana Lock Joint Concrete Pipe Company. One of the five platform-body trucks is seen at the right.



Partial view of the extensive outdoor storage yard.

• By HARRY F. UTLEY

NEW HOME OF DISTINCTION TO BE OPEN TO PUBLIC JUNE 17-18

The Dream Home built of Haydite concrete is keeping with a new movement in the congenial Better Homes and Gardens, will be open for public inspection Saturday and Sunday June 17 and 18. Located at 1123 King street, the dwelling takes its place with distinction in a residential district of fine homes. It will be open on Saturday from 2 p. m. until 9 p. m. and on Sunday from 10 a. m. until 9 p. m.

After Saturday and Sunday the home will be occupied by Mr. and Mrs. Ralph Sherwood, well known Lafayette contractor, for whom it has been in the concrete construction business for 30 years.

The Dream Home is the first of its kind to be built in Indiana. The design was presented after hundreds of home planners throughout the nation said Better Homes and Gardens what they desired — a home financing argument was more requisite for the Dream Home here when received than for any other plan owned by the magazine, enthusiastic interest popular approval among audience income families.

Hundreds To Attend

Hundreds of visitors in Lafayette have inspected the dwelling during construction and hundreds more are expected to view the home when it is open Saturday and Sunday. Experts will be on hand to explain the unusual details concerning the building of a concrete home.

When Better Homes & Gardens published the Dream Home plan, it was announced: "Every home should be a comfortable, convenient, safe and satisfactory investment, yet attractive features. This home requires them."

"You've asked for inexpensive but durable construction with a low maintenance cost. This home is built of fire-proof, long-lived concrete."

"You've asked for an attractive exterior with individuality with and confidence. This home has it."

Permanence in the terrain of the dwelling and permanence has been achieved by building the exterior walls of Haydite concrete masonry units and the floors of ground concrete floors and a concrete masonry has been used for 3 number of years in buildings of larger size and is fast becoming popular in home building because of its durable qualities. The construction of concrete floors and walls assure effective insulation against dampness, cracks and decay.

In addition, three important construction features make the Dream Home insect-proof, rodent-proof and fire-resistive. Concrete walls and floors will keep the dwelling cool and firm, defying fire, storm and decay.

Insulation Provided

More than ordinary insulation has been given to making the Dream Home comfortable in winter and summer. This has been accomplished by a process known as "cavity" insulation recently made by insulation. Wood furring strips are nailed to the concrete walls which vertically, and insulating board has been placed over the "furring" strips, thus creating a six-inch dead air space. The rock lath board of plaster will finish.

Ceilings throughout also have effective insulation. Rock wool lath forms the ceiling proper, while insulating board above memory of an attic room has been provided. Wood floors will be laid directly on the slab, forming an air space.

The home has an unusually firm foundation. The exterior walls rest on concrete footings 12 inches wide and 8 inches thick. The footings are reinforced with steel rods. The interior walls rest upon similar concrete footings which are reinforced with heavy wire mesh. The floor is supported by 8-inch ground concrete joists which are reinforced with concrete.

Comfortable, Convenient

The interior is designed for easy living, convenience, comfort and livability. Two entries lead to attractive garages with concrete floors and concrete walls. The living room, which is 14 feet 7 inches by 20 feet, is a model of beauty and comfort with gray brick panels adorning sides of the front entrance and a colonial gas burning fireplace equipped with two gas logs. Windows on three sides of the room are fitted with Venetian blinds.

The two dining alcove rooms adjacent to the rear of the living room and to have ordinary furniture placed in them, will be used as an interesting feature of the Dutch Door. Doors for refrigerator and kitchen cabinets are built in both sides of the alcove entrance.

The kitchen, with its many practical refinements will not be overlooked by the housewife. Cabinets and drawers are provided for every need and with labor saving devices. A dutch door, divided in two sections, completely separates the kitchen from the alcove of the living room. Cabinets and drawers provide ample storage space. Above the stove is a gas vent through which kitchen odors will be drawn by means of an attic fan.

Off the kitchen is a hall that leads to the side entrance and to the bedrooms and bath. Ample closet space is provided for clothing and bedding.

The living room, dining alcove, kitchen and hall are finished in tan to harmonize with the color scheme of the brick panels. Bedrooms are finished in tan to 6 inches and

Bathroom Is Modern

Located between the bedrooms the bathroom is fresh and modern, with its recessed tub-shower and other features in the tasteful design. Metal tile combined with mesh-finished plastering are an interesting wall effect. A large linen closet is a fine feature of the bathroom. Built-in wall-finished walls to all the rooms lend a refreshing appearance.

The sleeping rooms, dining alcove and bedroom are finished in light buff while the kitchen and bathroom are done in light green. Ample closet space and drawers are placed judiciously and each has removable metal screens for crisper. The wooden floor means it is easy matter to wash the outside of the paint floor the sands. Lighting fixtures are harmonizing with the interior decoration.

The full basement, reached by a stairway from the kitchen, is partly arranged in a divided room from to back by a concrete masonry partition. With half of the basement excavated to the previous room, 12 by 16 feet. The other half has three rooms, a 12 by 12 feet playroom for children, a utility room and closet, the latter with a two-tube gas-range heating system. Between the basement and the first floor is a full-size concrete cavity provide access to the attic room. At one end of this room is the gas heating plant featuring forced air circulation through base floors that lead to basement-level registers. Also in the attic is a half flat built in the attic. Closets are located over the floor. To enhance the forced air system may be used to accomplish the same purpose. The floor must have been carefully planned.

Exterior Attractive

The modern walls of the structure are attractive in appearance. Both the front and the rear of the home are in the light buff Roanoke masonry blocks placed grout in a shading contrast. All these units have single bead mortar. Especially attractive is the entrance to the home. Here the architect has provided a projecting recess, containing with the recessed entrance. The floor of the recess is of brick and the walls are of the same material as the exterior walls. The projecting garage with its concrete floor and concrete walls is also of interest. The garage has two doors, one leading into the yard and the other into the basement.

Extending from the garage to the front wall is one of the most interesting features of the home. The newly-married couple will be provided with a covered porch.

Call or See
Your Local Authorized
Haydite Building Unit
Manufacturer
Western Brick Co.
Danville, Ill.

Licensed Manufacturers Under the Light Weight Aggregate

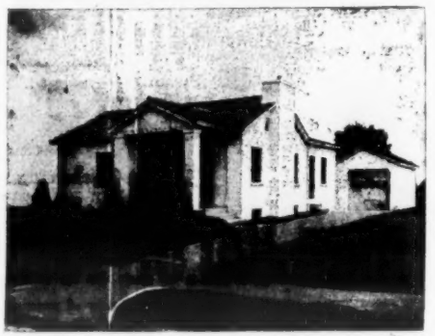
• HAYDITE
Multiple Utility
Walls Exclusive
Advantage!
Better Homes and Gardens
Dream House

FIRE-RESISTANCE

STRENGTH

LIGHT WEIGHT

S. S. Palma Cordially Invites You to The Opening of This Concrete Masonry "DREAM HOUSE"



At 1123 King St., Sat. and Sun., June 17-18

SATURDAY, from 2 p. m. 'til 9 p. m.---SUNDAY, from 10 a. m. 'til 9 p. m.

This is the self-same home that the Magazine "BETTER HOMES AND GARDENS" published for moderate income families . . . for folks who must have a lot for their money . . .

No Joy Like Coming Home to "A Home of Your Own!"

If you have children, there's the joy in knowing that they're getting their chance—the grow up in pleasant surroundings among desirable companions. But there's one thing alike to all home owners, whether they have families or not. It's the sense of pride and serious attachment. You each something and something lasting—a tribute to your character and ability. That's why! Why don't YOU experience this joy? Why own?

LOW COST FINANCING

LONG TERM Financing

Low cost FHA financing makes it possible to pay for your new home and have it cost you no more monthly payments than rent, on a plan that gives you full ownership of the home in 20 years—at a cost that in many cases is as much as 30% less than former financing costs!

HERE ARE THE REASONS WHY

Your house will be better designed, eliminating waste space

Your house will be better built with quality specifications to pass FHA inspection.

Your house will be more economical, new materials eliminate expensive upkeep.

Your house will be more efficient, better planned with labor-saving devices

For Further Information See or Call 36711

S. S. PALMA
CONCRETE CONSTRUCTOR FOR 30 YEARS
307 S. Seventh. Phone 36711
Lafayette, Ind.

CONGRATULATIONS
S. S. PALMA In the Opening of the Concrete Masonry
"DREAM HOUSE"

CONCRETE ADAPTED TO TYPE HOME YOU PREFER

This FIRE-SAFE HOME Distinguished by its:

• DRY BASEMENT WALLS
MACHINE-MADE MASONRY UNITS
• FULLY INSULATED WALLS
ABOVE GROUND OF HAYDITE "LIGHTWEIGHT UNITS"
• BASEMENT DRAINS
OF CONCRETE DRAIN TILE
• FLOORS
OF REINFORCED CONCRETE
• JOINTS AND BEAMS
OF PRECAST REINFORCED CONCRETE
• OUTSIDE FLUE
MACHINE MADE OF CONCRETE CHIMNEY BLOCKS

YOU MUST SEE IT!
FOR COMPLETE INFORMATION ON FIRE-SAFE CONCRETE HOME BUILDING
CALL OR SEE

Indiana Lock Joint Concrete Pipe Co.
PHONE 7852 LAFAYETTE, IND.

All Excavating, Gravel Sand and Grading Work
DONE BY
ORVAL M. HAGGERTY
Phone 3560

HARDWARE
for the
"DREAM HOUSE"
Furnished By
MOORE-KEMPLE HDWE CO

Landscaping
For the "Dream House"
BY
A. W. "Gus" CLEMENS

CONGRATULATIONS
S. S. PALMA
ON THE OPENING OF THE "DREAM HOUSE"
•
CONCRETE TILE ROOF
FURNISHED BY
Building Product Co.
BURLINGTON, IND.

Basement FLOORS MODERNIZED WITH Color
use TRUSCON
FLOR-DYE System

IT'S NEW different—the modern method of permanent floor decoration. Flor-Dye is not a paint, but dyes the concrete. It is color-fast, waterproof, fumeproof and traffic-resisting.

For the first time, it is now possible to decorate basement floors and do a lasting and economical job. Not attacked by moisture or condensation. A floor preservative and damp-proofer.

Easy to apply and economical to use. Four attractive colored floor colors. Drop in and ask us for attractive folder describing Flor-Dye, color samples and prices.

Flor-Dye Was Used
On the Basement Floors
of the "Dream House"

Huneck's
A PAINT FOR EVERY SURFACE
GLASS FOR EVERY PURPOSE
528 Main St. Dial 3841

DREAM HOUSE VISITORS WILL SEE MANY THINGS TO AMAZE THEM

Persons attending the opening of the Dream Home, a new, concrete dwelling erected by S. S. Palma, next Sunday at 1123 King street, will have a chance to inspect many unusual features of modern homes in a special manner of concealed home planners to be held soon, according to Orval Haggerty, president of the Indiana Lock Joint Concrete Pipe company, Lafayette. The company is sponsoring the display of sewer and other concrete products for the Dream Home.

Mr. Haggerty announced he had made arrangements with Fred E. McCosh of Indianapolis, housing commissioner for the Portland Cement association, to give his prize-winning lecture on "Modern Homes seen after June 17 and 18, the days the dwelling will be open for public inspection. Date and place of the meeting will be announced soon.

Mr. McCosh's discussion, supplemented by color photographs, deals with all the fundamentals of concrete home building and is especially instructive for home planners intending to build at present or at a later date. He will discuss the subject before a meeting composed largely of public officials of cities in Indiana and Kentucky, including members of different types of architectures, that classifying home owners and contractors in addition to the kind of homes they desire to build.

Mr. McCosh will also discuss the factors of fire safety, durability and low maintenance cost, securing the construction of a concrete home. Invitations will be given an opportunity to ask questions.

Class Outing At Francesville

FRANCESVILLE, June 16 — Miss Gladys Hunter entertained her Sunday School class in a picnic supper at the home of Mrs Glenn Roderick Gladden were present.

PASSAIC GIVEN

"Children's Day" services were held at the Methodist church "Unexpected Angel" a pageant, was given.

The Women's Missionary society of the Christian church met with Mrs Bert Overmyer.

Mr. and Mrs. Ralph Hunter of Indianapolis visited the Clay county of Chicago.

Mr. and Mrs. W. R. Stewart are visiting their daughter Mrs Robert Wilson, and family at Tristate Park, Ill.

Mr. and Mrs. C. G. Gutzwiller and Mrs. Hugh Hamilton are spending the week in Los Angeles, Cal., and other points of interest in the west.

Miss Dorothy Jones is visiting her sister Mrs. Dan Schlosser and family at Dunkirk, Ohio.

Congratulations -- S. S. Palma
ALL PLASTERING WORK
on the New "Dream House"
DONE BY
W. M. GLASS PLASTERER
1015 HOLLOWAY ST

Congratulations
S. S. PALMA
On the Opening of "The Dream House"
ALL ELECTRICAL INSTALLATION
BY
HISER ELECTRIC CO.
116 State St. Phone 4010

Every Floor in the *Dream House* covered with ARMSTRONG LINOLEUM
—the choice of discriminating householders, so splendidly constructed that it will last for many years. Notice the attractive colorings and designs so ultra smart in keeping with the modern building trend.

Every Window in the *Dream House* hung with GRENADA VENETIAN BLINDS
—the ultimate choice of every home builder . . . because they are controllable . . . improve the looks of your windows . . . are easily kept clean and come in all wanted shades to harmonize with your interior furnishings.

Loeb's
LOEB & MEINE COMPANY
HOME FURNISHING DEPARTMENTS
THIRD FLOOR

Congratulations, S. S. PALMA
ALL THE
PLUMBING INSTALLATION
BY
JOHN L. FAUSTICH
PLUMBING SHOP
1611 Kossuth Street. Phone 2770

MEDUSA PRODUCTS

MEDUSA-LITE
At a very small cost to you, you can make the interior of your home, office or plant look like new with Medusa-Lite, the flat, wall finish.

Medusa Portland Cement Paint
For painting brick, stucco, block and other concrete and masonry surfaces. A true portland cement base paint containing no lime, glue or casein—for either interior or exterior work.

MEDUSA FLOOR COATING
For interior concrete and masonry floors; moisture-proof, alkali-proof; stands more abrasive wear; covers further and is quick drying.

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1000 Midland Building
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Congratulations
S. S. PALMA
On the Opening of the "Dream House"
ALL PRODUCTS LISTED BELOW FURNISHED EXCLUSIVELY BY
BURKE BUILDERS SUPPLY COMPANY
• Certain-teed Fire Proof.
• Gypsum Lath and Plaster.
• Finish Lime.
• Silica Sand.
• Plaster Color.
• Metal Accessories.
• Steel Sash
• Insulation.
• Sewer Pipe and Flue Liners.
• Outside Paints and Caulking Cement.
BURKE BUILDERS' SUPPLY COMPANY
BUILDING MATERIALS LAFAYETTE, IND.
Main and Ninth Sts. Phone 4214
RICHARD BURKE JR. THOMAS E. BURKE

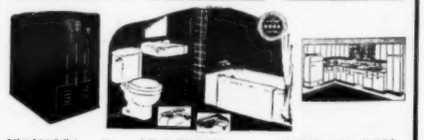
Congratulations
S. S. PALMA
AND
INDIANA LOCK JOINT CONCRETE PIPE CO.
•
Your "Dream House" Opens a New Era in Modern Home Construction.
We Are Happy That You Have Joined the "Swing to Heating By Gas."
•
PUBLIC SERVICE COMPANY OF INDIANA

Dreams Come True!
Through SEARS' Modern Home Planning Service

CONCRETE MASONRY "DREAM HOUSE"
Open for Inspection
Saturday and Sunday
June 17 and 18
1123 KING STREET

These Features Will Make Every House A "Dream House"

Gas Fired Forced Air Heating by Sears
Ultra-Modern Bath Fixtures and Dura Tile
No-Day Kitchen Sink Ensemble by Sears



• Clean Automatic Heat
• Forced Circulation
• Proper Humidity
• Economy
• Gleaming White Porcelain
• Chrome Plated Fixtures
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• Durable Sanitary and Drain Board Sink
• Steel Wall and Base Cabinets
• Disposal Dishes Plentiful
• Unlimited Hot-Water

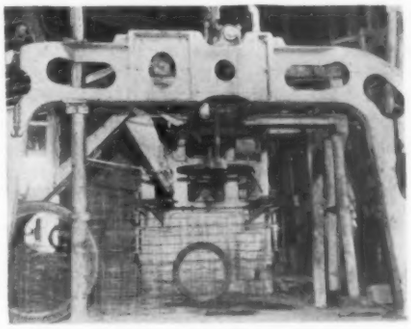
Third and South Sts. **SEARS, ROEBUCK AND CO.** Phone 4030
LAFAYETTE, IND.

Reproduction, reduced in size, of a two-page newspaper spread with coöperative advertising announcing the opening of the all-concrete demonstration house at LaFayette, Indiana.

(Continued from page 67)

ready taken title to it and now occupies it with his family as his own home.

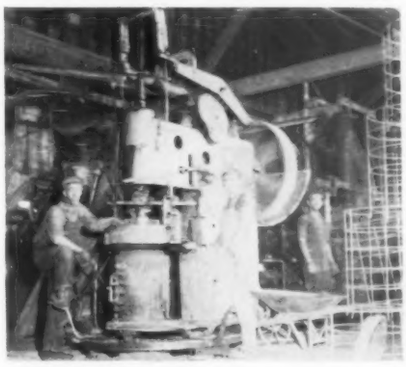
The Haydite blocks used in the walls of the house were made in the company's plant on the south side of La Fayette, although concrete pipes and tiles, in sizes from 4 to 60 inches, are the plant's chief products. Blocks are produced on a Besser Victory stripper, the Haydite being shipped in from



The heavy-duty machine which makes pipes up to 60 inches in diameter.

Danville, Illinois. Sand and gravel are purchased from the Western Indiana Sand and Gravel Company at La Fayette, which brings the materials in by trucks. Standard Portland cement is used almost exclusively, high-early-strength cement being utilized to a limited extent in cold weather.

There are five pipe and drain-tile machines in the plant. The largest of these is a Quinn heavy-duty machine



A machine making 24-inch pipe. Stripper for concrete block at the right.

of the "K" type, which is used to make large reinforced-concrete pipe sections up to 60 inches in diameter. Smaller pipes are produced on a Quinn "Monarch" and a Tuerck and McKenzie machine, both of which make bell-and-spigot and tongue-and-groove units. Drain tiles are made on a Quinn "National" and a Dunn machine, the former producing the larger tiles up to 30 inches in diameter while the Dunn equipment is used exclusively for 4-inch to 7-inch units.

All the concrete is mixed by a battery of five Besser batch-mixers arranged in line on the same floor level and behind the production machines. Short conveyors and skips carry the material to the machine hoppers.

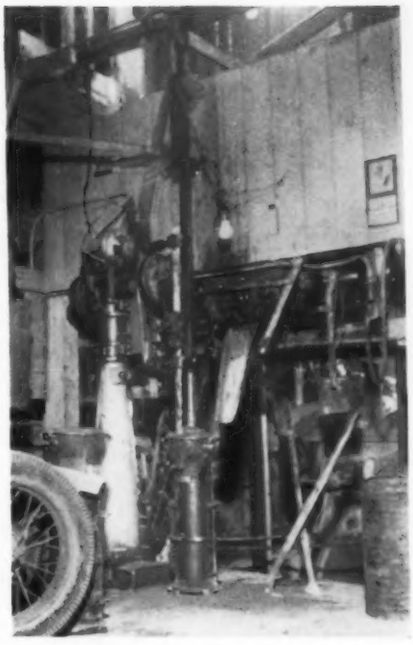
Except for the Quinn "K" type and Tuerck and McKenzie machines, which are powered by individual electric motors, the molding machines are driven through belts and shafting by a Frost stationary steam engine which is supplied from the same boiler that provides curing steam.

Eight pneumatic-tired carts are used to handle the pipes. Five of these were built at the plant, the remaining three being of Quinn manufacture. Barrett lift trucks handle the block output from the stripper.

There are seven low-pressure steam-curing rooms, each 80 feet long, 7½ feet high and ranging from 14 to 22 feet wide. Several acres of yard storage is provided to take care of the large stock of product usually maintained.

Pipe-reinforcing cages are rolled into shape at the plant and are fastened with a Federal spot-welder. Deliveries of finished products are made by a fleet of five General Motors trucks equipped with platform bodies.

The block output is in the neighborhood of 300,000 units annually. Rock-faced blocks are no longer produced because of the diminishing demand for units of this design. Sales are made direct and through building-supply dealers. Some direct-by-mail advertising is used in promotion and the newspapers and Indiana farm weeklies carry the firm's advertising regularly. Municipalities within a 100-mile radius and the state highway department are the chief outlets for pipe. Production of pipe and tile has been averaging about 10,000 tons annually. According to Miss Louise Harrison, secretary-



One of the small pipe machines. One of the five mixers in background.

treasurer, business this year has been running well ahead of 1938.

The Indiana Lock Joint Concrete Pipe Company has no connection with any concern similarly named. It has been in business nearly twenty years as the successor to the firm of Kirkpatrick and Harriman. Glenn Harriman, a son of the founder, is president, and John Matthys, who has been with the company continuously for 17 years, is plant superintendent. Recently C. F. Moss, a registered engineer, was added to the staff.

All products meet A.S.T.M. specifications and tests are carried out regularly by the engineering department of Purdue University. The firm has long been affiliated with the American Concrete Pipe Association.

A view inside one of the eight curing rooms.

The Eastwood concrete-products plant and some of the yard storage.

Educational Program Wins Wide Acceptance for Concrete Brick

THE first introduction of a product to a territory usually calls for considerable educational work by the producer in addition to the usual sales efforts. When concrete bricks are introduced into a territory where clay bricks have been manufactured for many years a story often results. This is the case with the Eastwood Sand and Gravel Works, which several years ago began to manufacture concrete brick in Grayville, Illinois.

This company has produced sand and gravel for over twenty-three years by dredging from the Wabash River. It was always progressive, maintaining leadership by installing new equipment as required to keep in line with the newest methods in the industry. Its progressiveness even extended to the sales of its materials and to its expert service. This resulted in increased sales and enabled the company to finance its expansion out of earnings.

This policy enabled it to dominate the sand-and-gravel business in its territory, but R. M. Eastwood, manager, was too ambitious to remain satisfied even with this enviable record as aggregate producer. This led him to do some real thinking along this line. "Why should we continue to sell only raw material?" Why don't we sell a finished product? In his investigation he found that finished products offer bigger profits. For example, the profit he made on a cubic yard of aggregate was multiplied two or three times by some manufacturers who were buying aggregate such as he was producing.

This, then, led him to ask what finished product would offer the best possibilities for his territory. His company had made concrete blocks in a limited way, so Mr. Eastwood was familiar with that material. He reasoned that because blocks were used principally for foundations and back-up, they apparently could not offer the possibilities of a product adaptable for exterior purposes in construction.

The ideal, as he saw it, would be a product that on account of its size and beauty would command high prices, offer permanence, structural strength, beauty, eye appeal and other added values that people were ready and willing to pay for.

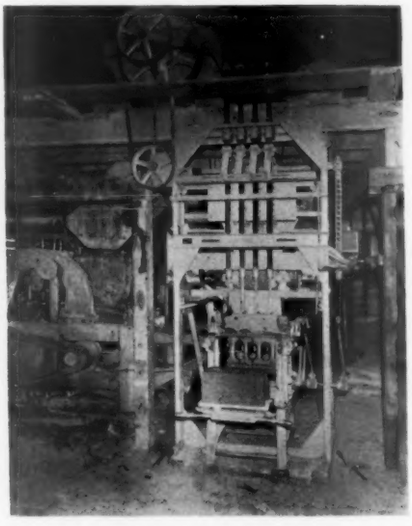
The answer which Mr. Eastwood found later was new machinery, new methods and formulas, already available for line production in brick-making, that would consume a large portion of his surplus aggregate, and provide finished products that could easily be sold right in his own territory.

In 1927 power equipment was installed for the manufacture of concrete blocks, and art objects, such as flower boxes and bird baths, were also made. In 1933 operations were moved to their present location and the products plant was enlarged. A Dunbrik machine was installed in 1937.

In marketing this company's new product Mr. Eastwood changed his sales methods entirely. Instead of sell-

The brick machine, rack, mixer and hoist.

Workmen transferring bricks from rack to outdoor storage.



Down-face block machine beneath the mixer.

ing back-up and foundation material on price, he sold face material on its merits for beauty and attractiveness and at a price that was not seriously questioned. To Mr. Eastwood's surprise, he found that the making and selling of products that offered beauty increased the sale for blocks for use in connection with his bricks, whether faced in the wide range of colors available or in natural gray.

The success of line-production methods, a new product, new beauty, with new methods of selling, within a few months compelled Mr. Eastwood to install power machines for the making of blocks and proved the correctness of his judgment in making and selling finished material, resulting in much more profitable operations and opening new markets for his finished product and his aggregate.

In May, 1939, the old block equipment was replaced with a Dunn downface block machine with a power tamper and feeder. The plant now has a capacity of 150 blocks per hour and 32 bricks per minute. Usually one of these products is made in a morning and the other in the afternoon.

Mr. Eastwood estimates that thousands of tons of aggregate have been disposed of in finished building material, which shows him two profits—one on aggregate, but the big one in the manufacture and sale of finished material. He also feels that this is just a beginning and that his sales of finished material will double and triple within a reasonable period of time.

R. M. Eastwood is manager of operations and Ivan Siekman is sales manager and together these men have been largely responsible for the success of this company in the concrete-products field. These men and others in the organization spent much time and effort in making personal calls, getting out circulars, newspaper advertising and other forms of publicity for their products. In order to overcome local prejudice in favor clay brick the results of comparative tests of both products were used to show the lower absorption of concrete brick. The fact that it was from 15 to 20 per cent. cheaper helped, as did also the wider variety of colors available. A model house was another important selling aid. From the first sales were made through local material dealers in order to secure their cooperation and much of the selling is still done in this manner. So successful have these efforts been that the plant has operated overtime nearly all this year.

The Dunbriks are made in six standard solid colors, and forty colors of Mat-Glazed bricks are also made through the use of Dunn spray equipment. The plain gray brick leads in popularity in this territory. The solid colors are also in demand. The bricks are sold chiefly for veneer facing in houses, factories and office and store buildings, and their use for back-up work is increasing.

Blocks are made in all sizes from 4 inches to 12 inches, and these are sold mainly for basement walls. Back-up tiles can also be made on the new block machine. These three products now make it possible for the company to supply the material for a building up to the eaves. Roof tiles are also made by hand. Some effort is also being made to popularize Dunbrik hollow-wall construction. Much is expected of a combination of a brick face with a

An industrial building built with Eastwood bricks—a power-plant at Fairfield, Illinois.

A public building utilizing the bricks—the new post-office at Carmi, Illinois.

A fine example of residential use of concrete bricks.

Rupert Eastwood

Ivan Siekman

back-up of 4- by 8- by 16-inch blocks. This construction combines an 8-inch wall with airspace insulation and the desirable brick face.

The company does not actually engage in construction but advises customers on design and construction and refers them to architects and contractors. Advertising is done in co-operation with the Federal Housing Administration and customers are aided in getting F.H.A. loans. This service has been an important factor in creating new business.

The company's sand-and-gravel operations have also been expanded and improved through the years. River equipment now consists of a new Diesel dredge, a towboat and four barges. About 60 cubic yards of gravel and 90 cubic yards of sand can be produced hourly. These materials are stored near the products plant. A complete description of these operations will be published in a later issue of PIT AND QUARRY.

The sand and fine gravel used in concrete products manufacture are discharged from trucks to piles. A batch is elevated to the 10-cubic foot mixer by a 10-cubic foot skip. Concrete can be discharged from this mixer into either the block or the brick machine. Dunn racks and lift jacks are used to move the products to outdoor storage for spray curing.

Joist Producer Has Busy Season

SPECIALIZING in the quantity production of concrete joists for large buildings, the Precast Unit Company, Kalamazoo, Michigan, is completing one of the most prosperous seasons in its ten years of operation. Because schools and hospitals must be of fireproof construction, the major share of its product goes into structures in these classes. Industrial and commercial buildings also utilize thousands of feet of this concern's joists annually, little effort being made to capture the residential market.

One of the pioneers in the joist branch of the concrete-units industry, the company markets its product under the trade name "Lith-I-Bar." The design of the joist and the machine which manufactures it were invented by the late Howard Young, who formed the Lith-I-Bar Company at Kalamazoo a number of years ago. Later patent rights were assigned to the Kalamazoo Haydite Tile Company and this company now handles the manufacturing end while its subsidiary, the Precast Unit Company does the marketing. C. Val Berry, manager of the Kalamazoo Haydite Tile Company is president of the Precast Unit Company. O. B. Trytten is engineer.

Only about 10 per cent. of the aggregate used in making Lith-I-Bar joists is natural, the remainder being Haydite, shipped in from the plant of the Western Brick Company at Danville, Illinois, where the shale is mined and burned. Conventional mixing methods are employed in preparing the concrete.

The joist machine is of the rolling type, no vibration being used to compact the material. The long steel pallet on which the joist is handled rests in a movable carriage in the machine. As it moves through, it is charged with the concrete from a hopper to one-half the thickness of the joist form. Then an electrically-welded reinforcing unit, fabricated in the shop, is accurately placed in the form. As the carriage moves through the machine again, the remainder of the concrete is placed and the joist passes under a series of ½-ton rollers which compact the concrete, producing a dense unit with a smooth finish. The joist is then hoisted from the machine and run into the steam-curing room.

The machine has a normal capacity of 1,500 feet of joist in 8 hours, but as much as 1,700 feet has been turned out, according to Mr. Trytten. Lengths up to 32 feet can be cast and the machine can be set for either 8-inch, 10-inch or 12-inch joists.

Tests are made frequently by the Pittsburgh Testing Laboratory which brings its recorders to the plant or the job site.

The word "TOP" is cast in the top face of all joists to aid the builder when they are set. The company also supplies wire hangers for holding the spreaders which support the slab forms. Ordinarily 1-inch sheathing is recommended for slab forms, but where the joists are to be exposed, Masonite Presdwood, plywood, or similar material is suggested for the forms to give the exposed ceiling slab a smooth, attractive appearance.

Besides the Kalamazoo installation, the company has two Lith-I-Bar machines operating in the East, one in the concrete-products plant of the Formigli Company in Philadelphia, the other in the New Haven, Connecticut, plant of the Dextone Company.

Prominent architects and engineers have accepted Lith-I-Bar joists as standard and have specified their installation in many important public and private buildings. The building departments of the larger cities, among them Detroit, Philadelphia and Grand Rapids, have approved their use.

Two large jobs were undertaken by the company this year—the new Men's Dormitory of the University of Michigan at Ann Arbor and the Michigan Children's Village at Coldwater, Mich., the latter a group of 12 buildings. Each of these two projects used about 100,000 feet—a total of nearly 40 miles of joists if laid end to end!

At present the company is completing the development of a concrete roof slab to be known as "Channelcrete," which bids fair to receive similar acceptance by the building industry when it is ready for the market. About 85 per cent. of the aggregate in the roof slabs is Haydite, the remainder being sand.

Conventional Haydite block and Dunbrik are also produced in the Kalamazoo plant for local consumption.

Concrete Masonry Assn. to Meet in Washington

The executive committee of the National Concrete Masonry Association at a recent meeting decided not to have any exhibits at the annual convention which will be held at the Mayflower Hotel, Washington, D. C., February 12, 13, 14, 1940.

Washington was selected as the convention headquarters in order to bring the convention closer to eastern and southern producers. Another consideration was the proximity to the National Bureau of Standards where a number of major researches important to the concrete masonry unit industry are being undertaken.

The executive committee also decided to place the Concrete Industries Exposition on a biennial basis to alternate with the big Road Show which is now on a biennial basis.

Accordingly the next exposition will be held in 1941.

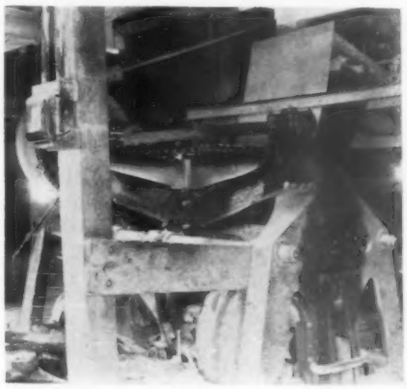
The Chain Belt Company of Milwaukee has acquired the business and all net assets of the Baldwin-Duckworth Chain Corporation of Springfield, Massachusetts. The merger grew out of a selling arrangement between the two firms. For some time Chain Belt has marketed finished roller chain made for it by Baldwin-Duckworth, and wished to assure itself of a permanent source of supply. There is little overlapping of products, Chain Belt never having manufactured any of the principal products of Baldwin-Duckworth.

Sand-Lime Process Admirably Suited to Making Quick-Cured Concrete Bricks

By J. MORLEY ZANDER
General Manager, Saginaw Brick Co.
Saginaw, Michigan

THE Saginaw Brick Company has been making some cement bricks for many years and in the last several years the sale of these bricks has increased. Perhaps our experience will have some interest for other sand-lime-brick plants which might develop additional sales by offering high-pressure steam-cured concrete bricks to the trade.

At our plant only natural aggregate is used, though high-pressure cured bricks and blocks can be made using the light-weight materials. The aggregate must contain nothing that will enlarge or soften under the high temperature and steam pressure to which it is subjected in the process of curing, and we try to get an aggregate of this kind. Close attention must be given to the grading of the sand, the mixing, and the tempering to make bricks of sand and cement successfully without pallets. The mix must not be too wet or too dry. It must be elastic enough to compress and stick together for piling on the cars. At Saginaw a grinding type of mixer that stirs, kneads, and grinds the materials together is used. The proportion of cement to aggregate

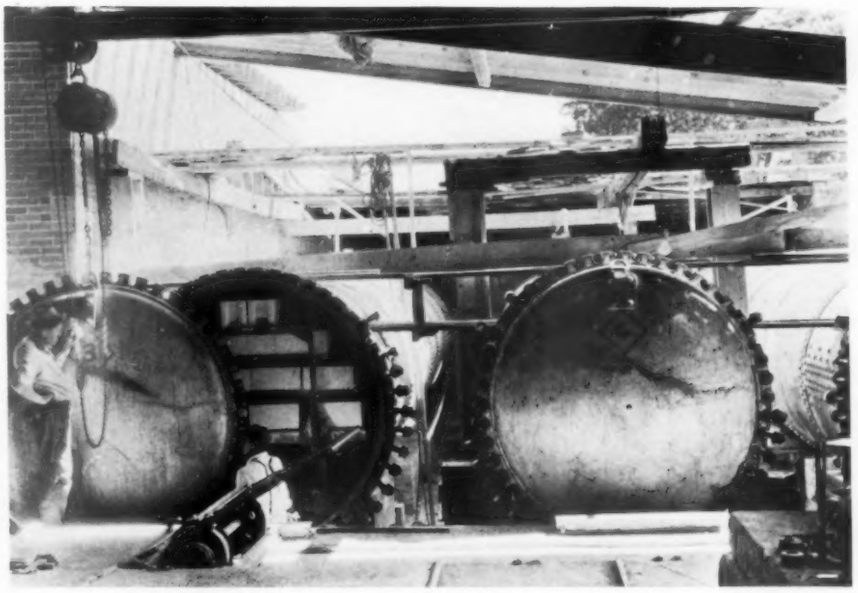


Machine which mixes and grinds material.

has been determined by experimentation, but it always seems to be possible to secure more blocks or bricks by thorough mixing and high-pressure steam curing than are secured by air curing.

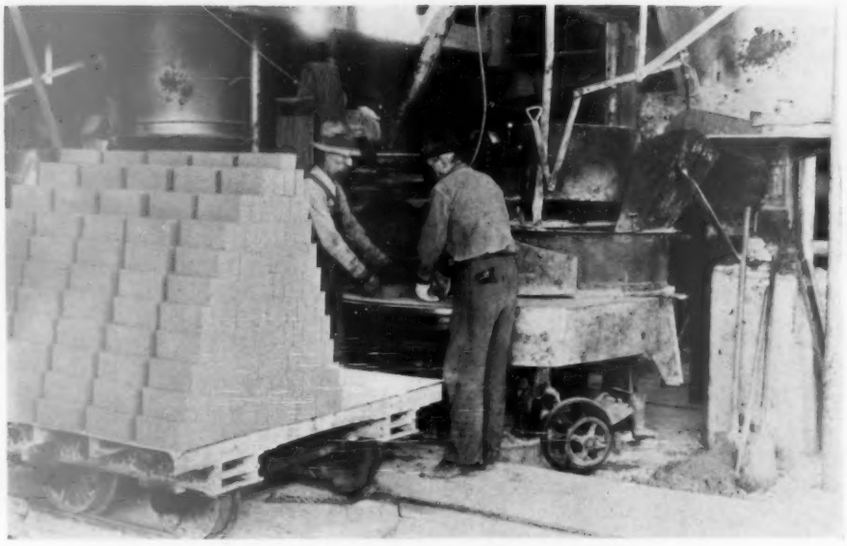
When the brick is being molded it is pressed together very firmly. Masonry units produced by high-pressure steam curing must have the cement and aggregate in very close contact when the curing is taking place, if all the cement is to be utilized.

View of the Saginaw Brick Company's plant and storage yard.



Retort head being removed showing rack of cured blocks.

Saginaw bricks were used in building Oakwood Memorial Mausoleum, Detroit.



Workmen pile bricks from press to car at the rate of 3,000 per hour.

CITY OF DETROIT
DEPARTMENT OF BUILDINGS AND SAFETY ENGINEERING
LABORATORY REPORT

Lab. No. 13783 — Date, Sept. 30, 1938
Tests for Building Department
2 Blocks, Saginaw Brick Co.
Sample for
Remarks:

Due 9-27-38

	S 4	S 3
Marked		
Size	8" x 7.75" x 15.75"	
Area	122 sq. in.	Absorption %, 8.44%
Load	226,300 pounds	48 hours
Unit Load	1,854 p.s.i.	

CITY OF DETROIT
DEPARTMENT OF BUILDINGS AND SAFETY ENGINEERING
LABORATORY REPORT

Lab. No. 13922 — Oct. 31, 1938
Tests for Building Department
4 Concrete Blocks, Saginaw Brick Co.
Sample for
Remarks:

Age Unknown

	S 7	S 8		S 5	S 6
Marked					
Size	8" x 7¾" x 15¾"		48 Hour		
Area	122 sq. in.		absorption	7.59 %	7.34 %
Load	222,300 pounds	242,250 pounds			
Unit Load	1,821 p.s.i.	1,985 p.s.i.			

PITTSBURGH TESTING LABORATORY
429 Wayne St., Detroit, Mich.
CERTIFICATE OF TEST
January 6, 1939

TEST OF CONCRETE BRICK FOR SAGINAW BRICK CO., SAGINAW, MICH.
COMPRESSING TEST

Order No. De-8779
File No.
Lab. No. 1-14693

Mark	Length	Width	Area	Total Load Pounds	Pounds per Square Inch	Specification Individual Minimum
1	4.15	3.75	15.56	47,500	3,053	
2	4.10	3.75	15.38	48,270	3,138	2,000
3	4.15	3.75	15.56	58,040	3,730	
4	4.10	3.75	15.38	57,170	3,718	
5	4.25	3.75	15.94	52,000	3,262	
				Average	3,380	2,500

These brick meet the Compression Test—ASTM C 55-37, Grade B.

ABSORPTION TEST

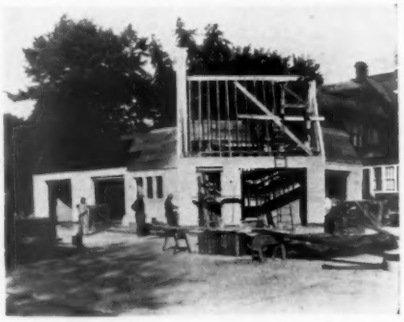
Mark	Per cent. Absorption
1	6.6
2	6.9
3	7.2
4	6.0
5	7.0

Absorption test was six hours.

It seems that in high-pressure steam curing the hydration of the cement is much more complete than can be expected in the air-curing process. Also, in the hydration of cement some hydrated lime is released and this, under the influence of the temperature and pressure of high-pressure steam, is combined with some of the available silica from the fine sand of the aggregate to form hydro-calcium silicate. This hydro-calcium silicate is the cement which the sand-lime-brick maker has been producing and using for many years in his sand-lime brick. This use of the released lime in the cement accounts in part for the additional blocks obtained per bag of cement.

The process of mixing, pressing, piling on cars, curing in high-pressure steam retorts, and time of curing is the same for cement-sand bricks as for lime-sand bricks.

The retorts used for this curing process are 6½ feet in diameter, and from



A service station being built with Saginaw bricks.

50 to 100 feet long. The heads are steam-pressure tight and are of bolted-on type. The retorts have removable heads on one end but are now being rearranged to provide removable heads on both ends.

A steel industrial track runs the whole length inside each retort and the loaded bricks are run into it on steel cars. The heat in the retorts is too high to allow the use of anything but metal to carry the bricks.

Another Saginaw brick job, a Kroger grocery store.

Arthur Hill High School, Saginaw. Back-up and interior walls consumed 600,000 concrete bricks made in the Saginaw plant.

Ten hours is the usual time required for the application of steam with the retort at 125 to 140 pounds pressure. The pressure is released as rapidly as possible when the time of curing is complete. When all the pressure is out of the retort the head is removed and the loads of bricks are ready to be pulled out and placed on trucks to go to the jobs. As saturated steam is used for curing, the bricks do not come out of the retorts absolutely dry, but generally contain slightly less than 3 per cent. residual moisture.

Blocks are made of slightly coarser material than are bricks, but the mix does contain some fine material. As in the case of bricks, this is needed to combine with the released lime from hydration of the cement. Blocks are handled in pallets and the mixing and high-pressure steam treatment is the same as for bricks.

A rack for blocks used on the 5-row brick cars carries 78 of the 8-inch blocks, and occupies 51 inches of length in the 78-inch retort. The block racks are of the lifting type and are shaped so that the loading will conform to the shape of the retort. Bricks, also, must be loaded to conform to the shape of the retort. In this way the greatest number of finished units are cured in each retort at each curing.

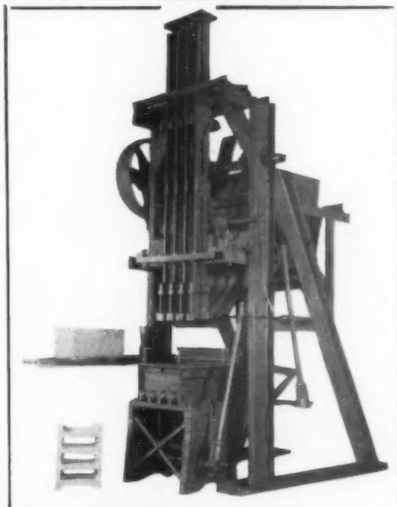
Production is carried on the year around as curing by high-pressure steam is not dependent on the weather. Bricks produced yesterday are laid in the wall to-day. These high-pressure steam-cured bricks are uniform in color, a light grey, and high in strength. The permanently fine appearance of walls built from these stabilized units is a real help in selling. Leaking and disfiguring shrinkage cracks are not a problem. Quality merchandise like these bricks and blocks can be sold on their merit.

Laboratory reports reproduced on the preceding page show the results of tests obtained on finished products the next day after production.

Awarded Pipe Contract for New Utah Aqueduct

The Utah Concrete Products Company of Salt Lake City has been awarded a contract to supply concrete pipe for the new Deer Creek Aqueduct.

A special plant for producing the pipe sections is to be constructed at the town of Pleasant Grove, Utah, work on the plant being scheduled to start early this month. A spur track from the main line of the Salt Lake & Utah Railroad to the plant site is now being laid. Construction of the plant will be superintended by Benjamin Beveridge.



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The Junior Stripper will turn out more blocks per man than any other hand-operated machine on the market . . . 200 per hour being easily maintained! Nor has quality of output been sacrificed for the sake of speed. Units are uniformly dense, true to shape, of uniform texture.

Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers and Joltcrete, Stearns mixers, and Cast Iron and Press Steel pallets, Straublox oscillating attachments, etc. Repair parts for: Anchor, Ideal, Universal, Stearns, Blystone mixers and many others.

ANCHOR CONCRETE MACHINERY CO.
G. M. Friel, Manager — Columbus, Ohio

Makes Blocks More Uniform In Density, Texture

In an eight hour period, the Kent Vibra-press will produce more blocks with less labor. Make us prove it.

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Wherever Concrete Pipe Are Made

R&L "CRESCENT" Pipe Molds
For Either Wet or Hand Process Manufacture

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Medium, Heavy and Extra Heavy Duty Forms for Sewers and Culverts, Well Casing, Drainage, Septic Tanks, etc.

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Kendallville, Indiana.
For more than 35 years makers of dependable concrete pipe molds and pipe machines.

books

for the CONCRETE MANUFACTURER

Concrete Industries Yearbook. 80 pages. Contains two chapters—"Concrete Units" and "Ready-Mixed Concrete." The section on "Concrete Units" completely covers the manufacture and merchandising of concrete-masonry units as well as pipe, tile, burial vaults, ornamentals, etc. The "Ready-Mixed Concrete" section covers the economics of the industry and deals with both popular methods of manufacture—central mixing, and central proportioning with mixing enroute. Plant design, operation, mixing and delivery control, supervision and administration are adequately covered, as is lime-putty.

Pit and Quarry Handbook (including the Directory of Cement, Gypsum, Lime Sand, Gravel and Crushed-Stone Plants). 792 pages, 8½ x 11½, 447 ill., 39 charts, 94 tables, cloth. Complete, concise and conveniently arranged technical reference work on all phases of designing, operating and maintaining non-metallic-mineral producing and manufacturing plants (cement, lime, gypsum, sand-and-gravel, crushed-stone, aggregates-bituminizing concrete products and ready-mixed-concrete). Accepted the world over as the standard authority.

Pit and Quarry Directory. (The Directory Section of the Handbook, published separately). Complete alphabetical and geographical lists of non-metallic-mineral producing and manufacturing companies and their plants. 254 pages, 8½ x 11½, paper.

Concrete Engineers' Handbook. By George A. Hool and Nathan C. Johnson. 800 pages. A compact reference book containing tables, formulas and data on plain and reinforced concrete. The standard authority for concrete engineers and should find a place in the library of every concrete-products and ready-mixed operator.

Basic Principles of Concrete Making. By Franklin R. McMillan. 99 pages. Mr. McMillan, who is director of research for the Portland Cement Association, undertakes a thorough, understandable discussion of the principles underlying efficient concrete mixing — a subject which many operators can profitably study.

Concrete Practice. By George A. Hool and H. E. Pulver. 369 pages. A simple, practical explanation of the best practices in the proportioning, mixing and placing of concrete; in the inspection and testing of concrete; in concrete construction methods, and in making estimates for concrete jobs.

Concrete Costs. By Frederick W. Taylor and Sanford E. Thompson. 709 pages, cloth. A comprehensive work covering the various factors which enter into the cost of concrete work. An invaluable reference book for the producer, contractor or engineer.

Concrete Work. By William K. Hatt and Walter C. Voss. (Two volumes) Vol. 1, 451 pages, is a book to aid the self-development of workers in concrete and deals with plans, specifications, details and precast concrete. Vol. 2, 206 pages, contains 97 job sheets devised to uncover the fundamental principles and operations of computing, selection of materials, mixing and placing concrete, upon which most of the applications of concrete are founded.

Public Relations—a Handbook of Publicity. By John C. Long. 248 pages. Although on the general field of publicity and public relations, this book will help the concrete-products and ready-mixed-concrete operator gain publicity for his product by pointing out the ways and means for developing such publicity through his local newspaper.

Concrete Designers' Manual. By George A. Hool and Charles S. Whitney. 327 pages. Contains tables and diagrams for the design of slabs, beams, columns, etc. Rulings pertaining to design and working stresses are also covered.

Plain Concrete. By Edward E. Bauer. 364 pages. A detailed discussion of the production of concrete, covering every step from the selection and preparation of materials to placing, finishing and curing. Special emphasis is given to facts useful in the preparation of specifications and in testing concrete materials and finished concrete. Contains instructions for the performance of laboratory tests on materials and cured concrete.

Reinforced Concrete and Masonry Structures. 722 pages. The work of 14 specialists, this book offers a practical and detailed discussion of every important element entering into the design and construction of concrete and masonry structures.

ORDER BLANK

Book Department, Pit and Quarry Publications, 538 S. Clark St., Chicago

Enclosed find remittance for $..... for which please send postpaid, the books checked below.

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And the Concrete

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Successful business operations depend upon sustained PERFORMANCE—not claims. Years of study and research by our engineers resulted in the Multiplex Super Tamper—every part designed for perfect performance in producing concrete blocks.

This heavy duty, all-steel welded machine makes strong units with less tamping—reduced agitation of material and less vibration insure longer life. Has positive and automatic feed control; is adaptable for all kinds of aggregates.

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Win Profits WITH THE SMITH-MOBILE "11"

Now you can tackle your ready-mixed concrete problems with assurance of victory! Just put the SMITH-MOBILE "11" into action. These 11 exclusive features will help you reach your PROFIT goal. And remember, the SMITH-MOBILE is the ONLY truckmixer having any one of these features:

1 **HIGH DISCHARGE** — 27" to 34" higher than old-style truck mixers. No hoist or ramp required.
2 **CONTROLLED DISCHARGE** — pour it fast or slow. The concrete comes out in a smooth steady flow and without segregation.
3 **VISIBLE MIXING** — Open the door and look into drum while drum is revolving. Watch the mix. SEE what's going on inside.
4 **FEED CHUTE CHARGING** — Loaded on the level, no ramp needed. Easy to spot under bin.
5 **DRUM REVOLVES WHILE CHARGING**—Shrinking and mixing start instantly. Carries larger loads.
6 **NO LOADING HATCHES** to open or close. Driver can stay right in cab.
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11 **BETTER AND FASTER MIXING** — Scientifically designed T-shaped spiral blades provide a fast end-to-end movement of the aggregates.

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THE *Modern* TRUCK MIXER and AGITATOR

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They Installed 4 "Built-to-Endure" Marietta Concrete Storage Bins - -

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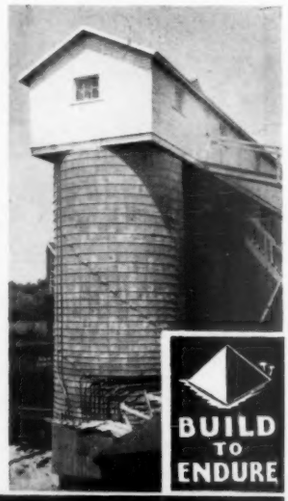

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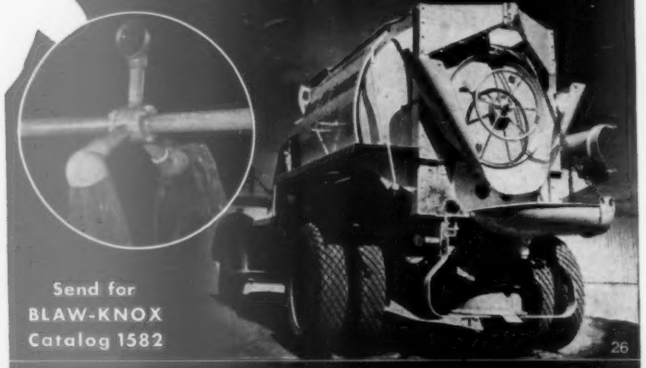
The new, fast water impeller that won't clog; an accurate and dependable water measuring system; superb mixing action—and assurance of dependable continuous operation make Blaw-Knox Trukmixers the popular choice, and the practical buy for you. Study these features before you decide.



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Blaw-Knox Truck Mixer Loading Plants include overhead storage bins for aggregates and cement; accurate Weighing Batchers for aggregates, cement and water; arranged for manual or automatic operation; complete conveyors for handling materials from cars or trucks to bins, when desired—all properly designed and built to your requirements as an efficient unit for truck mixer loading. See Blaw-Knox Catalog No. 1582.

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Cost is low, compared to short life of wood, as the Commercial pallet will not crack, warp, or splinter—a long time investment.

Superior to cast iron. When a Commercial steel pallet is dropped it will not break.

Lighter and cheaper than plain pallets, easier to handle.

Close core box fit, the right pallet for the new vibrating machines.

New designs, new air spaces.

Write us or your machine manufacturer

The COMMERCIAL SHEARING & STAMPING COMPANY
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Only Jaeger Truck Mixers Give You These Features . . .

DUAL-MIX ACTION produces higher strength concrete—as proved by the Hollister Tests !

THROW-BACK BLADES — essential to fast, thoro mix. Only Jaeger has them !

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SYPHO-METER TANK — insures accurate water control !

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COR-TEN STEEL — lighter, stronger, resists both rust and abrasion !

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THE JAEGER MACHINE CO.
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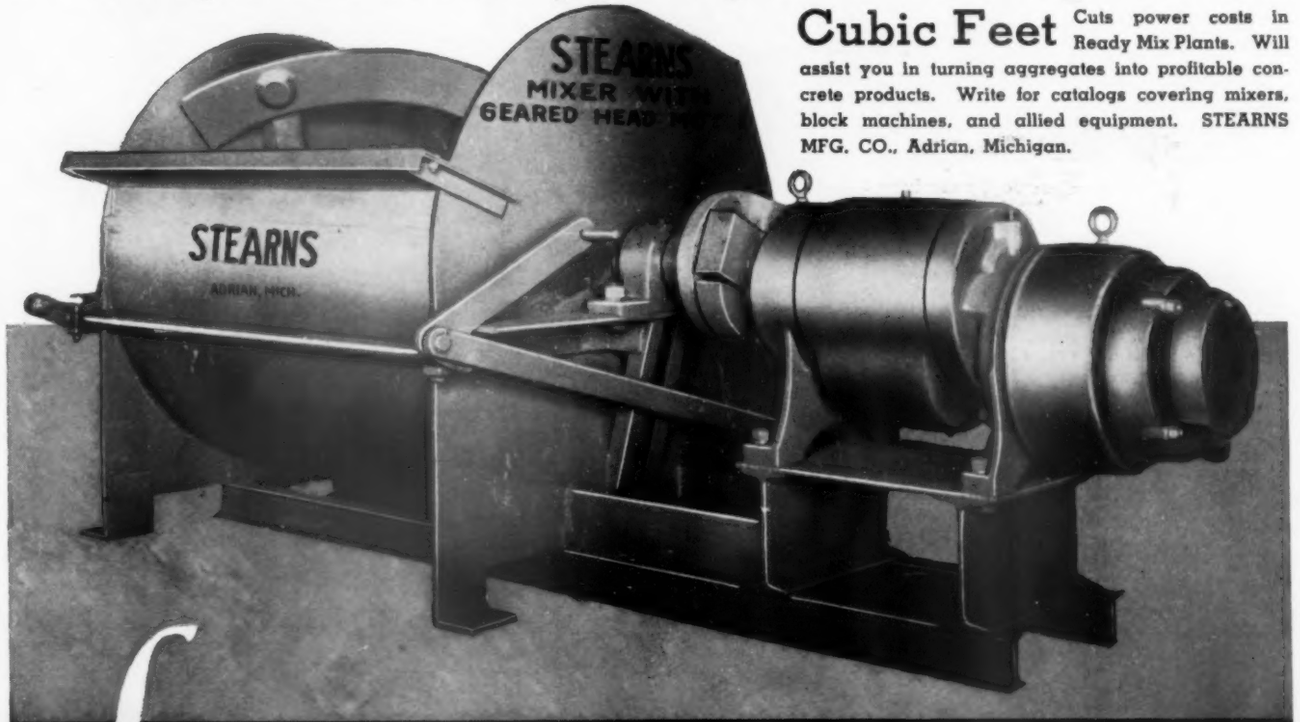
Prompt Delivery—Capacities up to 42 Cubic Feet

Cuts power costs in Ready Mix Plants. Will assist you in turning aggregates into profitable concrete products. Write for catalogs covering mixers, block machines, and allied equipment. STEARNS MFG. CO., Adrian, Michigan.



Stearns - the mixer with bar-type liners

The CONCRETE MANUFACTURER

YES SIR!!

A CHEAPER WAY OF

PRODUCING CONCRETE BRICK

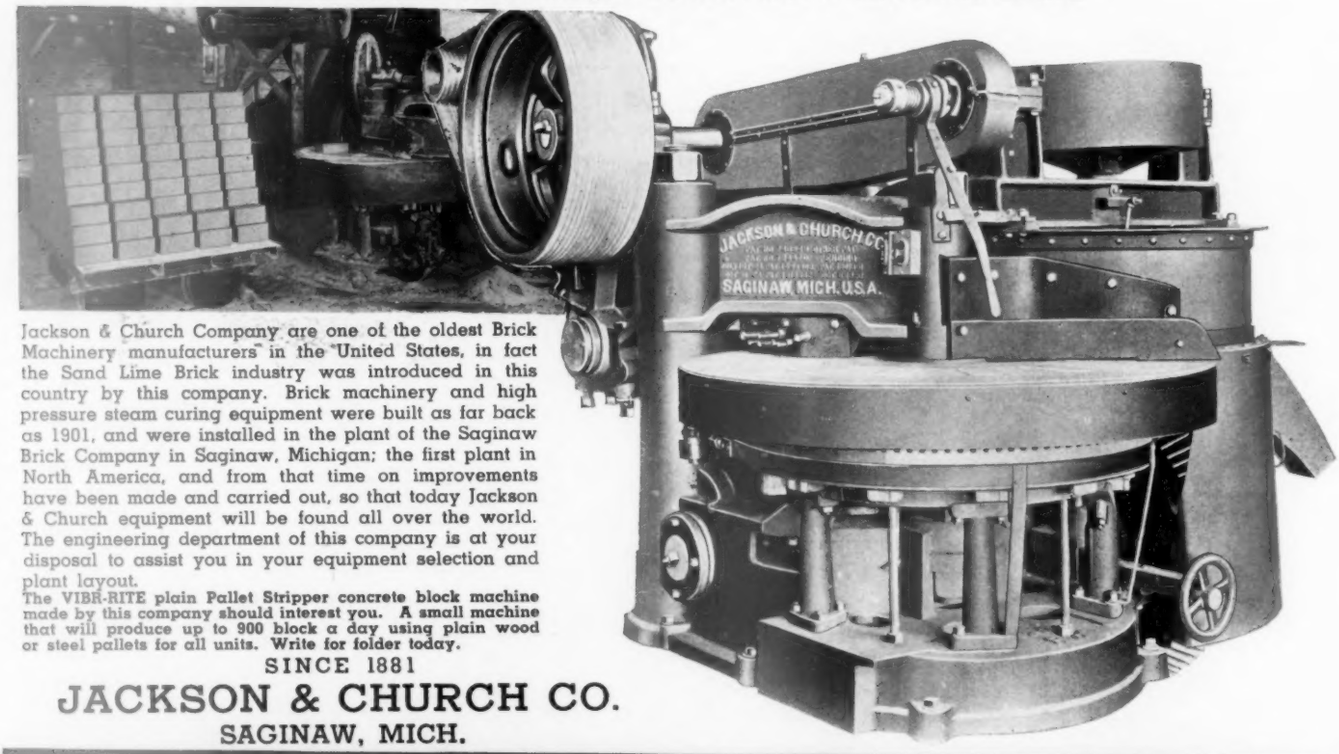
LEANER MIXES HIGHER STRENGTHS
LOWER ABSORPTION NO PALLETS NEEDED

A process and equipment that has been used for over thirty years in the manufacture of sand lime and concrete brick. The JACKSON & CHURCH brick machines will enable you to produce concrete brick at a cost that will give you a good profit in today's highly competitive markets. Well built, low maintenance cost, high production and simple to operate.

Positively NO PALLETS are used as the brick are taken right from the machine and stacked on to each other on to flat deck cars or racks. They may be cured the same as concrete block, with low pressure steam or moist cured by air. All brick are accurate in size, of smooth texture with clean sharp edges. Cinder, Haydite, Waylite, Superock, Pottsco and other light-weight aggregate brick can be made on these machines.

Colored Concrete Face Brick can be made by adding the color to the mix or the brick may be sprayed after they are made. A large market is opening up in the low cost home field for this type of product. Why not tap this new source of profit by putting in a Jackson & Church Brick Machine in your plant. Write today for full information.

Model-"A" Brick machine will produce from 3000 to 3500 bricks an hour
Model-"C" Brick machine will produce from 1500 to 1800 bricks an hour



Jackson & Church Company are one of the oldest Brick Machinery manufacturers in the United States, in fact the Sand Lime Brick industry was introduced in this country by this company. Brick machinery and high pressure steam curing equipment were built as far back as 1901, and were installed in the plant of the Saginaw Brick Company in Saginaw, Michigan; the first plant in North America, and from that time on improvements have been made and carried out, so that today Jackson & Church equipment will be found all over the world. The engineering department of this company is at your disposal to assist you in your equipment selection and plant layout.

The VIBR-RITE plain Pallet Stripper concrete block machine made by this company should interest you. A small machine that will produce up to 900 block a day using plain wood or steel pallets for all units. Write for folder today.

SINCE 1881

JACKSON & CHURCH CO.

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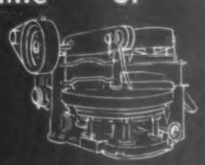
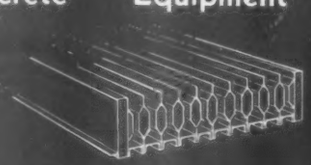
Complete Line of Concrete Equipment

VIBRATION and TAMP BLOCK MACHINES

MIXERS


BRICK MACHINES


CONCRETE JOIST MACHINES

MATERIAL HANDLING EQUIPMENT

WEAR STOPS HERE!

KUE-KEN'S new principle of crushing without abrasion has reduced wear so much that, compared to ordinary crushers, wear is almost stopped. The arrows on the line drawing indicate the path of jaw travel on a KUE-KEN crusher. No rubbing or abrasion between the jaws. Wear slowed down to a walk. After crushing over 10,000 tons of very hard river gravel, a pair of jaws from a KUE-KEN were accurately weighed. Original weight of two jaws 690 lbs. Present weight 622 lbs. 68 lbs. consumption after **crushing over 10,000 tons of hard gravel!** This figures out to only .0068 lbs. per ton crushed. This slight wear was distributed evenly over the plate. **Absolutely no hollows or ridges!** Examination of several crushers in the field has shown practically no wear on operating mechanism. This is the result of low bearing pressures plus perfect cool, dust free lubrication.
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BULLETIN NO. 600 CONTAINS MUCH MORE COMPLETE INFORMATION. ALSO DETAILS OF FREE CRUSHING TEST SERVICE.

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POWER-WHEEL
LEVER-ARM
LINK-TYPE

stand-up on tough jobs . . .

Tough handling jobs merely prove the better construction of Industrial Brownhoist Clamshells. They stay on the job in spite of all kinds of punishment and emphasize the importance of our forty years experience in the design and building of buckets that boost production and reduce costs.

Would you like to have complete information on Industrial Brownhoist Buckets? Booklets 353 describes the complete line—½ to 15 yards capacity. Send for a copy.

INDUSTRIAL BROWNHOIST CORPORATION, BAY CITY, MICHIGAN
District Offices: New York, Philadelphia, Pittsburgh, Cleveland, Chicago

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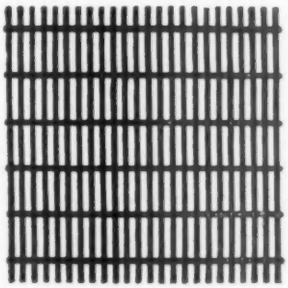

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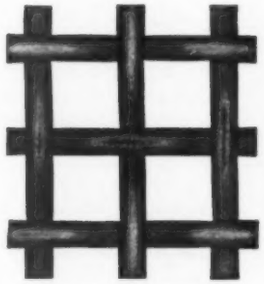
Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



2 Mesh .162 Ga.

THE CLEVELAND WIRE CLOTH & MFG. COMPANY
574 E. 78th St. CLEVELAND, OHIO

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified.

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Belt Lacing
Flexible Steel Lacing Co.

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Caps (Blasting, Electric)
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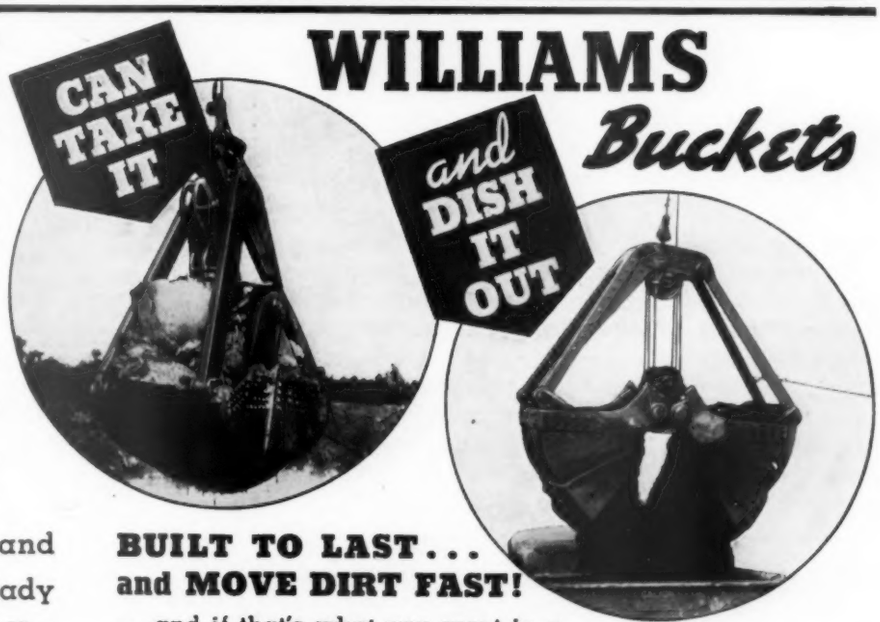

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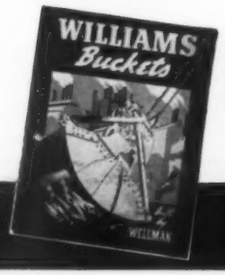

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***built by* WELLMAN**

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CP ROCK DRILLS

BUYERS' GUIDE

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*Austin-Western Road Machy. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
Rogers Iron Works
Straub Mfg. Co.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Cutter Heads (Dredging)
*Eagle Iron Works

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National Powder Co.

Diesel Engines (See Engines—Diesel)

* See also detail information in the 1939 Pit and Quarry HANDBOOK.

Dippers and Teeth (Power Shovel)
*Bucyrus-Erie Co.
*Koehring Co.

Dragline Cableway Excavators
*Bucyrus-Erie Co.
*Link-Belt Co.
Page Engineering Co.
*Sauerman Bros., Inc.

Dragline Excavators
*Austin-Western Road Machy. Co.
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Jackson & Church Co.
*Koehring Co.
*Link-Belt Co.
Page Engineering Co.

Draglines (Walking)
*Bucyrus-Monighan Co.

Dredges
*Bucyrus-Erie Co.
Hetherington & Berner, Inc.
*Morris Machine Works

Driers
Jackson & Church Co.
Lewistown Fdry. & Machine
*Link-Belt Co.
McCarter Iron Works, Inc.
McLanahan & Stone Corp.
*Traylor Eng. & Mfg. Corp.
Tyler Co., W. S.

Drill Bit Reconditioning
*Bucyrus-Erie Co.

Drill Bits
*Bucyrus-Erie Co.
*Chicago Pneumatic Tool Co.

Drill Sharpening Machinery
*Bucyrus-Erie Co.

Drill Steel
*Chicago Pneumatic Tool Co.

Drilling Accessories
*Bucyrus-Erie Co.
*Chicago Pneumatic Tool Co.
Timken Roller Bearing Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
*Bucyrus-Erie Co.
*Chicago Pneumatic Tool Co.

Drills (Core)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Diamond)
*Chicago Pneumatic Tool Co.
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Drifting)
*Chicago Pneumatic Tool Co.

Drills (Hand—Hammer)
*Chicago Pneumatic Tool Co.

Drills (Rock)
*Chicago Pneumatic Tool Co.
*Jeffrey Mfg. Co.

Drills (Sinking)
*Chicago Pneumatic Tool Co.

Drills (Stoping)
*Chicago Pneumatic Tool Co.

Drills (Wagon)
*Bucyrus-Erie Co.
*Chicago Pneumatic Tool Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple Belt, Chain, Rope)
*Link-Belt Co.

Dust Arresters
*Blaw-Knox Co.
*Buell Engineering Co.

Dust Collecting Systems
*Blaw-Knox Co.
*Buell Engineering Co.
McCarter Iron Works, Inc.
*Raymond Pulverizer Division of the Combustion Engineering Co.

Dust Conveying Systems
*Blaw-Knox Co.
*Fuller Company

Dust Filters
*Buell Engineering Co.

Dynamite (See Explosives)

Dynamos
*General Electric Co.

Electric Cables (See Cables—Electric)

Electrical Equipment
*General Electric Co.

Electrodes (Welding)
Stulz-Sickles Co.

Elevator Belting (See Belting)

Elevator Buckets (See Buckets—Elevator and Conveyor)

Elevators (See Conveyors and Elevators)

Engineers
Bacon, Inc., Earle C.
*Fuller Company
Hetherington & Berner, Inc.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
Wellman Engineering Co.

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*Chicago Pneumatic Tool Co.
*Nordberg Mfg. Co.
Page Engineering Co.

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*Chicago Pneumatic Tool Co.
*Nordberg Mfg. Co.
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*Nordberg Mfg. Co.

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Explosives
National Powder Co.

Fabricating (Electric Arc and Oxy Acetylene)
Stulz-Sickles Co.

Fans (Exhaust)
*General Electric Co.
*Jeffrey Mfg. Co.

Feeders
*Fuller Company
*Jeffrey Mfg. Co.
*Link-Belt Co.
McCarter Iron Works, Inc.
*McLanahan and Stone Corp.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.
Straub Mfg. Co.
*Traylor Engr. & Mfg. Co.

Filters (Drum)
Denver Equipment Co.

Flotation Machinery
Denver Equipment Co.

Furnaces (Heat Treating, Electric)
*General Electric Co.

Fuses (Detonating)
*Ensign-Bickford Co.
National Powder Co.

Fuses (Electrical)
*General Electric Co.

Gas Producers
Wellman Engineering Co.

Gaskets
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.

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*Haiss Mfg. Co., Geo.
*Link-Belt Co.

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*General Electric Co.

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*General Electric Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Sprout, Waldron & Co.

Gears and Pinions
*General Electric Co.
*Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.

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Generator Sets (Motor)
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*Robins Conveying Belt Co.
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Taylor Forge & Pipe Works

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*Robins Conveying Belt Co.
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*Jeffrey Mfg. Co.
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*Robins Conveying Belt Co.
Sprout, Waldron & Co.

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*General Electric Co.
Plymouth Loco. Works Div. of the Fate-Root-Heath Co.

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*General Electric Co.

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*General Electric Co.
Plymouth Loco. Works Div. of the Fate-Root-Heath Co.

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*General Electric Co.
Plymouth Loco. Works Div. of the Fate-Root-Heath Co.

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*General Electric Co.

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*General Electric Co.
*Jeffrey Mfg. Co.

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Goodyear Tire & Rubber Co.

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*Smidth & Co., F. L.
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*American Pulverizer Co.
Jackson & Church Co.
*Jeffrey Mfg. Co.
Lewistown Fdry. & Mach. Co.
*Raymond Pulverizer Division of the Combustion Engineering Co.
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*Smidth & Co., F. L.
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*Williams Patent Crusher & Pulverizer Co.

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McCarter Iron Works, Inc.

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Hetherington & Berner, Inc.
*Link-Belt Co.
McCarter Iron Works, Inc.
*Warren Bros. Roads Co.

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Anchor Concrete Machy. Co.
*Kent Machine Co.
*Koehring Co.
*Link-Belt Co.
Miles Mfg. Co.
*Multiplex Concrete Machinery Co.
*Stearns Mfg. Co.

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*General Electric Co.
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*General Electric Co.

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*Kent Machine Co.
*Multiplex Concrete Machinery Co.
R & L Concrete Machy. Co.
*Stearns Mfg. Co.

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*American Steel & Wire Co.

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*Deister Concentrator Co.

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*Deister Concentrator Co.
*Link-Belt Co.

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*General Electric Co.

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*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.

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Commercial Shearing & Stamping Co.
*Multiplex Concrete Machinery Co.
*Stearns Mfg. Co.

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Jackson & Church Co.

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*National Wire Cloth Co.

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*Jaeger Machine Co.
*Koehring Co.

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Chicago Perforating Co.
*Hendrick Mfg. Co.
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*Sprout, Waldron & Co.

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Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Fittings
Hetherington & Berner, Inc.

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*R & L Concrete Machy. Co.

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*R & L Concrete Machy. Co.

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Naylor Pipe Co.
Taylor Forge & Pipe Co.

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*Fuller Company
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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
*Austin-Western Road Machy. Co.
*Barber-Greene Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*McLanahan and Stone Corp.
*Williams Patent Crusher & Pulverizer Co.

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*American Steel & Wire Co.

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Miles Mfg. Co.

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*Kent Machine Co.
Miles Mfg. Co.
*Multiplex Concrete Machinery Co.
*Stearns Mfg. Co.

Power Units (Internal Combustion)
*Chicago Pneumatic Tool Co.
*Nordberg Mfg. Co.

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*Sauerman Bros., Inc.

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*Easton Car & Construction Co.

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Manganese Steel Forge Co.

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*General Electric Co.

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*Kent Machine Co.
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*Link-Belt Co.
McCarter Iron Works, Inc.
*Traylor Engr. & Mfg. Co.

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Denver Equipment Co.

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Miles Mfg. Co.

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Tires (Truck, Passenger Car or Tractor)
Goodyear Tire & Rubber Co.

Tools (Drill) (See Drilling Accessories)

Track Shifters
*Nordberg Mfg. Co.

Trailers
Ford Motor Co.

Trailers (Industrial)
*Easton Car & Construction Co.
Ford Motor Co.

Trailers for Excavators
Link-Belt Co.

Tramways (Aerial Wire Rope)
*American Steel & Wire Co.
*Roebling's Sons Co., John A.

Transformers
*General Electric Co.

Transmission Belting (See Belting)

Transmission Machinery
*Jeffrey Mfg. Co.
*Link-Belt Co.

Trench Hoes (Pull Shovels)
*Link Belt Co.

Trippers
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
*Blaw-Knox Co.
*Jaeger Machine Co.
*Smith Co., T. L.

Trucks and Trailers
(See Motor Trucks)

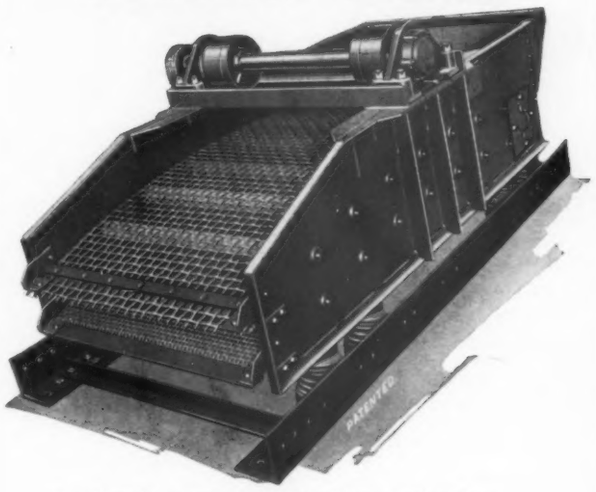
Trucks (Industrial Electric and Gas Electric)
*Easton Car & Construction Co.

Tubes for Tire Casing
Goodyear Tire & Rubber Co.

Tube-Mills (See Mills—Ball, Tube, etc.)

*See also detail information in the 1939 Pit and Quarry HANDBOOK.

DEISTER PLAT-O VIBRATING SCREEN



1. Simple powerful vibrating mechanism.
2. Screen cloth automatically held under uniform tension.
3. Any one screening surface changed without disturbing remaining decks.
4. Cushioned vibration.

DEISTER MACHINE CO.

1933 E. WAYNE ST. FT. WAYNE, IND.

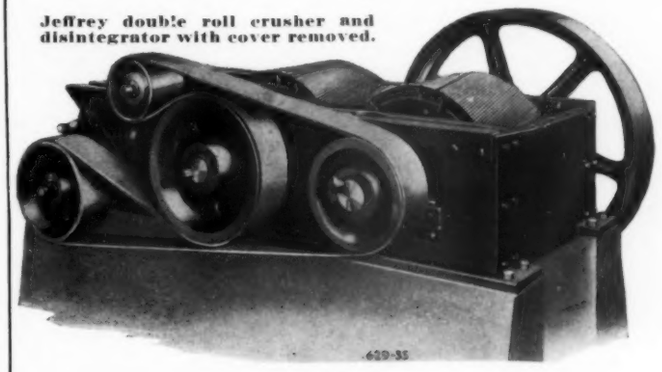
DOUBLE ROLL CRUSHERS AND DISINTEGRATORS

Various friable material of medium hardness such as limestone chips, burned lime, chemicals, cinders, dry clay, rock salt and many others . . . are being successfully reduced with Jeffrey double roll crushers and disintegrators.

They have unbreakable welded steel frames, very stiff and rigid. Bearings are fitted with removable bronze bushings; rolls are belted together and the segments are readily renewable.

Jeffrey also builds single roll, rotary ring and Flextooth crushers, pulverizers and shredders . . . all designed to reduce your operating costs and to improve your product. Write today.

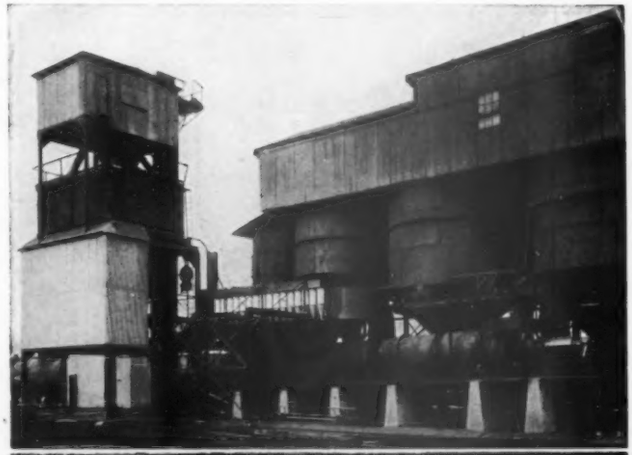
Jeffrey double roll crusher and disintegrator with cover removed.



Reduction Division

THE JEFFREY MANUFACTURING COMPANY

917-99 North Fourth Street, Columbus, Ohio



WARREN ASPHALT PLANTS

HOT MIX —— COLD MIX

OR

COMBINATION UNIT FOR BOTH TYPES

CAPACITY DESIGN AND ARRANGEMENT TO MEET ANY REQUIREMENTS

Designed and Built

—— By ——

WARREN BROTHERS ROADS CO.

P. O. BOX 1869

Boston Massachusetts

SAUERMAN LONG RANGE MACHINES

MOVE MATERIALS FOR A FEW CENTS PER TON

Sauerman Scraper handles 100,000-ton storage pile of crushed rock for cement mill.

One man with small Sauerman Cableway digs 500 tons of river gravel per day.

IN deciding what type of equipment to adopt for any problem of excavating or stockpiling, special consideration should be given to four outstanding advantages of Sauerman Scraper and Cableway machines. These advantages are:

(1) Sauerman machines combine digging, hauling and dumping in a continuous automatic operation.

(2) First cost is reasonable.

(3) Operated by one man.

(4) Maintenance is simple.

As a result of the above features, Sauerman machines are able to handle most jobs of wet or dry excavation and of storing and reclaiming bulk materials at the lowest possible cost per cubic yard. Hundreds of leading pit and quarry operators will testify to the truth of this statement. We'll be glad to study your problem and tell you what a Sauerman machine can do for you.

WRITE FOR CATALOG

SAUERMAN BROS., INC.

434 S. Clinton St., CHICAGO

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Turbines
*General Electric Co.

Turntables (Industrial)
*Easton Car & Construction Co.

Unit Heaters
*General Electric Co.

Unloaders (Box Car)
*Barber-Greene Co.
*Fuller Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Valves (Pump)
*Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

Vibrating Screen Plate
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Vibrating Screens (See Screens—Vibrating)

Vibrators
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Tyler Co., W. S.

Vibrators (Concrete)
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Jackson & Church Co.
*Multiplex Concrete Machy. Co.
*Stearns Mfg. Co.

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*Austin-Western Road Machy. Co.
*Koehring Co.

Washers (Sand, Gravel and Stone)
*Austin-Western Road Machy. Co.
*Eagle Iron Works
*Haiss Mfg. Co., Geo.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Smidth & Co., F. L.
Smith Engr. Works
Straub Mfg. Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Weighing Equipment (Automatic)
*Blaw-Knox Co.
*Fuller Co.
*Jaeger Machine Co.
McCarter Iron Works, Inc.

Welding & Cutting Equipment.
*General Electric Co.
Stulz-Sickles Co.

Welding Bars, Wedge and Applicator (Nickel-Manganese Steel)
Stulz-Sickles Co.

Welding Rods
Stulz-Sickles Co.

Welding Service
Stulz-Sickles Co.

Welding Supplies
*American Steel & Wire Co.
*General Electric Co.
Harnischfeger Corp.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.

Wheels (Car)
Jackson & Church Co.

Winches and Capstans
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Wire and Cable (Electric)
*American Steel & Wire Co.
*General Electric Co.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Ludlow-Saylor Wire Co.
Manganese Steel Forge Co.
*National Wire Cloth Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
*Tyler Co., W. S.

Wire Rope
*American Cable Division of the American Chain & Cable Co.
*American Steel & Wire Co.
Gilmore Wire Rope Division of the Jones & Laughlin Steel Corp.
*Roebling's Sons Co., John A.

Wire Rope Fittings
*American Cable Division of the American Chain & Cable Co.
*American Steel & Wire Co.
Gilmore Wire Rope Division of the Jones & Laughlin Steel Corp.
Page Engineering Co.
*Roebling's Sons Co., John A.

Wire Rope Slings
*American Cable Division of the American Chain & Cable Co.
*American Steel & Wire Co.
Gilmore Wire Rope Division of the Jones & Laughlin Steel Corp.
*Roebling's Sons Co., John A.

Wire (Welding)
*American Steel & Wire Co.
Gilmore Wire Rope Division of the Jones & Laughlin Steel Corp.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.

Worm Gears (See Gears and Pinions)

*See also detail information in the 1939 Pit and Quarry HANDBOOK.

Typical repairs and patches made with Flexco HD Rip Plates.

THOUSANDS of men in industrial plants, mines and mills all over the country are doing just what this man is doing. They are cutting costs by repairing conveyor belts with Flexco HD Rip Plates.

WRITE TODAY FOR FOLDER W R P that shows how easy it is to repair rips, to strengthen soft spots and to put in patches by using Flexco HD rip plates. The folder also shows how to make tight butt joints in both conveyor and elevator belts with Flexco HD Belt Fasteners. These fasteners are made in five sizes. Furnished in special analysis steel for general use and in various alloys to meet special conditions.

Flexco HD Rip Plate

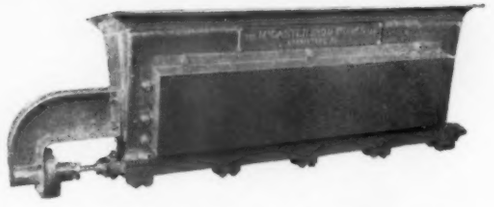
Flexco HD Belt Fastener

FLEXIBLE STEEL LACING CO.
4623 Lexington St., Chicago, Ill.

FLEXCO HD BELT FASTENERS
REG. U.S. PAT. OFFICE
Sold by supply houses everywhere

A New "Scoop" in Asphalt Industry!

McCARTER A.C. Buckets



Dip into bigger profits with McCarter A. C. Buckets.

These features explain why McCarter Buckets "scoop the field":

Non-Tilting—Non-Leaking Type
Steam or Electrically heated
Full length of Mixer
Uniform discharge—instantly—directly into the aggregates

The McCARTER line also includes Pug Mill Mixers and patented Telescopic Driers, efficient equipment necessary to the modern asphalt plant.

McCARTER designs, fabricates and erects complete asphalt plants to suit individual requirements. Old, worn out equipment replaced with new, *profit-making* machinery.

Write for Bulletin

Designers and Manufacturers Uninterruptedly since 1827

The McCarter Iron Works, Inc.
NORRISTOWN PENNSYLVANIA

Consolidated Offers:

LOCOMOTIVE

16-ton Whitcomb Gasoline Locomotive, standard gauge, 6-cylinder, 6x7 motor, self-starter. 90% new. Running demonstration.

SHOVELS AND CRANES

1—Bucyrus-Erie 10-B Shovel, ⅜ yard.
1—Byers ½ yard gasoline Shovel.
1—Lorain 75-B gasoline Shovel, 1½ yd.
1—Lorain 77 Diesel Shovel.
1—Lorain 77 Diesel Crane.
1—50-B Bucyrus-Erie Dragline, 60′ boom, Atlas Imperial Engine.
1—30-B Bucyrus-Erie Dragline, Atlas Imperial Engine.
1—Monighan 3-T, Diesel Driven 3 yard Walking Dragline.

JAW CRUSHERS

42″x48″ Traylor; 15x30, 18x36, 24x36, 30x42, Farrel; 24″x36″, 36x48 Allis-Chalmers; 30x42 Buchanan.

FINISHING GYRATORY CRUSHERS

2′ and 3′ Symons; 3′ Traylor; 4′ Traylor No. 410-TZ; 5′ Newhouse with 40 H.P. motor; Nos. 19, 25, 37, 49 Kennedy.

PULVERIZERS

1—4-roll Raymond High Side Mills, also 3-roll.
3—5 and 6-roll Raymond Low Side Mills.
8—Raymond beater types, Nos. 0000, 00, 1, 3, and Nos. 32, 55, 60 and 90 Imp. Mills.
4—Sturtevant Ring Roll Mills, Nos. 0, 1, 2.
Coal Pulverizers—Raymond, Aero, Erie City, Simplex, Kennedy.
Kent Maxecon and Bradley Mills.

AIR CLASSIFIERS

2—10′ Sturtevant "Whirlwind."
3—8′, 10′, 12′, 14′ Gayco.
1—30″ Raymond.

VIBRATING SCREENS

3—5′x10′ Symons Screens, 2-deck, each with 7½ H.P. 3/60/440 volt motor.
3—4′x7′ Jeffrey-Traylor FB-4, magnetic, all 2-deck. Used 30 days. With motor generator sets, panels, etc.
1—4′x8′ Robins Gyrex, 2-deck.
2—3′x6′ Sturtevant Moto-Vibro, 2-deck.
8—Tyler Hummers, 3′x5′, 4x5, 4x7, 1 to 3 decks.

BINS AND TANKS

6—10′x30′ Vertical Steel Tanks, 125 tons. At Peekskill, N. Y.
1—Blaw Knox 300 bbl. Cement Bin, electric scales, generator sets. Complete.

ROTARY DRYERS

9—3′x20′, 4x30, 5x30, 6x40, 6x60, 8x60, 8′ 8″x85′.
2—5x30′, 70″x35′ Ruggles-Coles, double shell.
1—5x35′ Indirect Heat, double shell.

ROTARY KILNS

3—6′x40′ Bonnot, each complete with firing hood, spring seals and with or without rotary coolers; also 4′x30′ Ruggles-Coles; 5x50′ Vulcan; 5′4x33′ Fuller; 6x60′ Reeves; 7x100′ Vulcan; 8x110′ Reeves.

BALL, ROD AND TUBE MILLS

2—6′x12′ Hardinge Rod Mills—direct drive.
2—6′x12′ Allis-Chalmers Rod Mills, inc. motors.
1—3′x12′ Hendy Tube Mill.
1—5′x36′ Vulcan, 3-comp. iron lined, used 3 days.
6—Hardinge Conical Mills—4′6″x16″, 5′x22″, 6′x22″, 8′x30″.
1—6′x8′ Patterson cont. Mill with air separator.
8—Pebble Mills; 4′ 6″x3′ 6″, 5x4, 6x8, 7′6x5′ and other sizes.
4—5′x22′, 6x22, Tube Mills—iron and silex lined.
1—5′x10′ Marcy Rod Mill.

AIR COMPRESSORS

2—POC-2 I.R., 550 CFM, Diesel driven.
1—PRE-2 I.R., 1300 CFM, syn. motor.
2—WN-31 Sullivan, 1573 CFM, syn. motors.

Write for detailed illustrated circulars

CONSOLIDATED PRODUCTS CO., INC.

17-19 PARK ROW **NEW YORK, N. Y.**

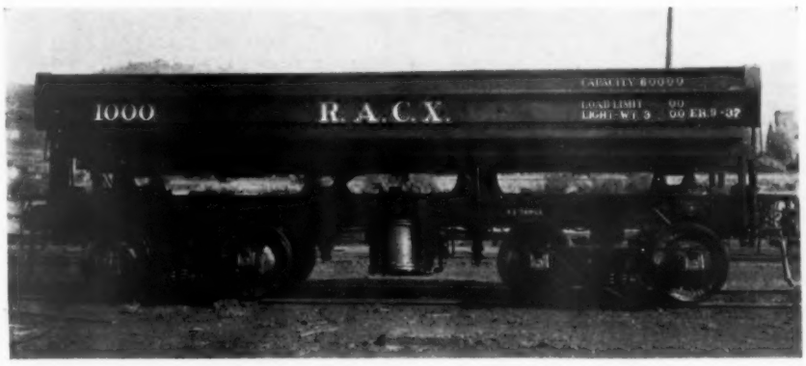
Our shops at Newark, N. J., cover eight acres

RECONDITIONED EQUIPMENT

One Clyde 25 H.P. electric two speed drag scraper hoist, $500.00.
One Lambert 80 H.P. electric twin drum mast and gaff hoist equipped with magnetic motor brake, $1,000.00.
One 10 H.P. electric vertical capstan, $250.00.
Three 20-ton American Terry No. 3 guy derricks, 90′ boom, 80′ mast, complete with guys and fittings, $1500.00 each.
One Lambert 60 H.P. electric triple drum hoist, $900.00.
One Thomas 40 H.P. gasoline double drum hoist, $600.00.
Three Sullivan 310′ gasoline portable air compressors, $650.00 each.
Two Sullivan 220′ gasoline portable air compressors, $650.00 each.
One Sullivan 160′ gasoline portable air compressor, $500.00.
Two 6″ Sterling self-priming centrifugal pumps, $400.00 each.
Two 4″ Sterling self-priming centrifugal pumps, $150.00 each.
One 24″ Portable belt conveyor, 40′ long, $600.00.
One 24″ Portable belt conveyor, 60′ long, $750.00.

Crane Type Motors
3 phase, 60 cycle, 220 volts
125 H.P. G.E. 720 R.P.M. $750.00.
100 H.P. G.E. 900 R.P.M. $600.00.
80 H.P. G.E. 720 R.P.M. $450.00.
60 H.P. G.E. 900 R.P.M. $325.00.
50 H.P. G.E. 900 R.P.M. $275.00.
40 H.P. G.E. 900 R.P.M. $225.00.

UNITED HOISTING CO., INC.
Serving the Construction Industry for 47 years
175 Locust Avenue, New York, N. Y.
MElrose 5-2100



FOR SALE

18-Kilbourne & Jacobs 16 cu. Yard air operated Dump Cars, fully rebuilt and available for immediate inspection and delivery, quotations and prints gladly furnished.

RAILWAY ACCESSORIES COMPANY, 3408 Carew Tower, Cincinnati, Ohio

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RAILROAD EQUIPMENT

Hopper Cars — Gondola Cars
Flat Cars — Box Cars

Freight Car Replacement Parts.
Relaying Rails and Accessories.
We can furnish nationwide service.
Write—Wire—Phone us your inquiries.

HYMAN-MICHAELS COMPANY
122 S. Michigan Avenue
Chicago

Other Offices
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625 Market Street,
SAN FRANCISCO, CALIF.
837 E. Gage Avenue,
LOS ANGELES, CALIF.

GRAVEL PLANT EQUIPMENT

By Owner

Bucyrus 50-B Elec. Shovel—440 V.—60 cyc.—1½ Yd.	No. 4651	150 HP Motor	GE	220 V. 3 ph.	600 RPM
P & H Model 600 gas shovel, 1 Yd.	No. 3564	50 HP Motor	WEST	220 V. 3 ph.	1120 RPM
20 Ton Amer. Hoist & Derrick Crane, steam 1½ Yd.	No. 1115	50 HP Motor	GE	220 V. 3 ph.	900 RPM
7″ Newhouse Crusher	No. 8286	50 HP Motor	GE	220 V. 3 ph.	900 RPM
Scalper Screen—72″ x 12′—Galland Henning.		30 HP Motor	GE	220 V. 3 ph.	1800 RPM
Washing Screen—60″ x 12′—Galland Henning.		30 HP Motor	GE	220 V. 3 ph.	720 RPM
6″ Fairbanks Morse pump—direct conn. 50 HP motor.		25 HP Motor	GE	220 V. 3 ph.	720 RPM
10″—CI pipe—70 lb. rail—24″ belt.		15 HP Motor	GE	220 V. 3 ph.	1200 RPM
Head and tail pulley assemblies—rollers and idlers.		15 HP Motor	WEST	220 V. 3 ph.	860 RPM
		5 HP Motor	GE	220 V. 3 ph.	1200 RPM
		5 HP Motor	Allis-Chal.	220 V. 3 ph.	1200 RPM

ALL SUBJECT TO PRIOR SALE

WISCONSIN SAND AND GRAVEL COMPANY

623 NORTH SECOND STREET **MILWAUKEE, WISCONSIN**

POSITION WANTED

Cement Plant Executive—Age 35—With twenty years' experience in the manufacture of Portland, special and masonry cements, desires connection with progressive concern regardless as to location. Has worked in various cement plants in the capacity of Chemist, Plant Superintendent, and General Manager, and during past ten years has done considerable work in the development of special cements and the designing of equipment for their manufacture.

Send replies to
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PIT AND QUARRY PUBLICATIONS
538 S. Clark St. Chicago, Ill.

WANTED

Six, all steel, 36″ gauge, 4—5 yard quarry or pit cars similar to Easton's Phoenix or Koppel's Pan Type.

Send replies to
BOX 1006
PIT AND QUARRY PUBLICATIONS
538 S. Clark St. Chicago, Ill.

WANTED

Equipment Salesman — Southern Indiana Territory. Must be familiar with and able to SELL dirt moving, rock drilling, paving and construction equipment in general. Prefer man having 5 years minimum experience machinery sales. Send full particulars, age, experience, qualifications, photograph. Replies held in strictest confidence.

Send replies to
BOX 1003
PIT AND QUARRY PUBLICATIONS
538 S. Clark St., Chicago, Ill.

Belt Conveyors In Stock

36″ Belt, Idlers and End Pulleys.
36″ L-B Self-Contained Apron Feeder.
30″ Belt, Idlers and H & T Assemblies.
24″ x 38′ Belt Conveyor on Steel Frame.
24″ Gravity Take-Ups.
24″ and 18″ Hand-Propelled Belt Trippers.
2—24″ Reciprocating Plate Feeders.
16″ and 14″ Belt, Idlers and Pulleys.
12″—36″ Friction and Conveyor Belt.

Bucket Elevators in Stock

10″ x 33′ Enclosed Type Chain Elevator.
14″ x 33′ Open Type Chain Elevator.
Elevator Buckets for Belt and Chain.
14″ New 8-ply Rubber Covered Belt.

Crushers, Mills and Grizzlys

Telsmith No. 30 Rotary Grizzly.
Hardinge 8′ x 22″ Pebble Mill.
Traylor Bulldog 8″ Gyratory Crusher.
28″ x 30″ Corrugated Mang. Crushing Rolls.

Vibrating Screens in Stock

3 x 5′ Multirap 1-deck, Wet or Dry Screen.
2—3 x 5 Hummers 1-deck, V-16 Vibrators.
2—3 x 5 Hummers 2-deck, V-16 Vibrators.
3 x 6 Plat-O 1-deck, with V-Belt Drive.
2—4 x 5 Hummers 2-deck, V-16 Vibrators.
4 x 5 Hummer 2-deck, with V-40 Vibrator.
3—4 x 8 Robins Gyrex 2-deck Screens.
2—4 x 8 Robins Perfex Shaking Screens.
3 x 5 and 4 x 5 New Lot Wire Screen Sections.

G. A. UNVERZAGT,
15 Park Row, New York City.

Rebuilt Equipment

McMYLER 35-ton Type J Locomotive Crane; 50′ Boom; Air Brakes; Double Drums.
AMERICAN 40 ton 4 Wheel Saddle Tank Type Locomotive.
P&H model 206—¾ yard crane.
BROWNHOIST 40 ton Locomotive crane.
VULCAN 8 ton Std. Ga. gas locomotive.
BALDWIN 58 ton 6 wheel switcher, 12x24″ cyl. Walscheart valve gear.
WESTERN 6 yard hand dump cars.
NORDBERG model S track shifters.
KOEHRING Model No. 1—¾ Yd. Dragline.
K&J 16 Yd. Air Dump Cars.
ORTON 18 Ton 3 Wheel Loco. Crane 50 ft. Boom; Natl. Bd. Boiler.
P&H Model 330, ¾ Yd. Dragline.
PLYMOUTH 12 Ton 36″ Ga. Gasoline Locomotive; Hand Brakes.
WILLIAMS ½ yd. Clamshell Bucket.

Write for Complete List

SOUTHERN IRON & EQUIPMENT COMPANY
Plant & General Offices
Atlanta, Georgia

EQUIPMENT FOR SALE CHEAP

1—Vulcan 40 ton Std. Ga. Saddle tank locomotive.
1—Marion 1 yd. Steam crane 40′ boom on cats.
1—Russell Grader, 10′ Blade.
1—Link-Belt K-30 Trench Hoe, 45′ Boom.
1—Link-Belt K-44 shovel 50′ boom, fairleads.
1—Lorain 75 B 1¼ yd. chain crowd shovel.
2—Whitcomb 12 Ton 36″ Gauge Locomotives.
2—C. P. Compressors, 590 cu. ft., 100 h.p. motor.
2—Worthington Compressors, 621 cu. ft., 75 h.p. mtr.
1—Monarch 75 Caterpillar with bulldozer.
1—Sullivan 210′ portable compressor.
1—Ingersoll-Rand pavement breaker.
6—Easton 4 yd. all steel 36″ Ga. cars.
4000′ of 9″ x 9″ road forms.
1—Ransome 27 E Paver.
2—No. 116 Chicago Pneumatic Paving Breakers.
2—1 yd. Insley bottom dump concrete buckets.
1—Schramm No. 120 Compressor.
1—1 yd. Owen Bucket.
1—1 yd. Kiesler rehandling bucket.
1—¾ yd. Browning clamshell bucket.
1—¾ yd. Blaw-Knox bucket.
1—Le Courtney 6″ Cent. Pump, 40 h.p. motors.
1—Morris 8″ dredge pump, 150 h.p. G.E. motor.
1—Morris 10″ cent. pump, 2250 GPM at 130′ head.
1—Goulds 12″ cent. pump, 50 h.p. G.E. motor.
1—Thompson 6″ self-priming pump, Waukesha motor.
2—Gardner Denver Sheeting Hammers.
2—Humdinger 6″ self-priming pumps, gas motor.
1—Humdinger 4″ self-priming pump.
1—Humdinger 2″ self-priming pump.
1—Domestic double diaphragm pump, gas motor.
1—G.E. motor, 200 h.p. slipring.
2—No. 9 B 2 McKiernan-Terry Hammers.
3—No. 5 McKiernan-Terry Hammers.
3—No. 7 McKiernan-Terry Hammers.

HARRY C. LEWIS
325 Frelinghuysen Avenue Newark, N. J.

For Prompt Shipment Subject to Prior Sale

10 x 36 Gruendler Roller Bearing Crusher with RA2P LeRoi Engine.
28′ Elevator.
36 x 12′ Screen.
30 Ton, 4 compartment Bin.
26′ Reject Conveyor (Slightly used, as good as new).
NEW 15 x 36 Gruendler Roller Bearing Jaw Crusher.
NEW 11 x 20 Bronze Bearing Jaw Crusher.
NEW 24 x 36 Plain Bearing Jaw Crusher.
NEW 30 x 18 Roller Bearing Double Roll Crusher.
1—USED 5 ton per hour Day Pulverizer.
1—USED 10 to 15 ton per hour Gruendler Pulverizer.
1—NEW 10 to 15 ton per hour Pulverizer.
1—NEW 6 to 7 ton per hour Gruendler Pulverizer.
1—36 x 16′ Trunnion type Revolving Screen with Dust Jacket.

CRUSHER SERVICE
Box 975
St. Louis Missouri

FOR SALE OR RENT

2—Lorain 75-A comb. shovel-crane No. 3876 and 4210. 50′-0″booms.....$3750.00 ea.
1—Lorain 75-A shovel, 1¼ yd. capy. No. 3929. ..... $2950.00
1—Lorain 60, No. 4074, 1 yd. Comb. Shovel-Crane. 70′ boom.....$2875.00
1—Bucyrus-Erie GA-2 Shovel No. 4064, 1¼ yd. $1750.00
1—P&H Mod. 400, No. 3954, ¾ yd. shovel $2150.00
1—Universal Truck Crane No. 1310 mounted 4 speed Mack.....$1950.00
1—Whitcomb 4 Ton, 24″ ga. Gasoline locomotive. Like New.....$395.00
2—Whitcomb 6 Ton, 24″ ga. Gasoline locomotives. Good .....$350.00 ea.
2—Owen Mod. 23 Type M ¼ yd. Clam Shell. Almost New .....$285.00 ea.

Hundreds of other items equally as attractive. We pay Highest Cash Prices for Modern Used Equipment. What do you have to offer?

CHARLES DREIFUS CO.
R. H. Boyer, Mgr. Equip. Div.
Widener Bldg. Phila., Pa.
Bell Phone Rit. 7750

LOCOMOTIVES

85 Ton American 2-8-0 separate tender, 21x28″ cylinders.
80 Ton Baldwin 8-wheel switcher, 0-8-0 separate tender, 21x28″ cylinders.
82 Ton American 6-wheel switcher, 0-6-0 separate tender, 21x28″ cylinders.
75 Ton Baldwin 6-wheel switcher, 0-6-0 separate tender, 21x26″ cylinders.
72 Ton Baldwin 6-wheel switcher, 0-6-0 separate tender, 20x26″ cylinders.
60 Ton Baldwin 6-wheel switcher, 0-6-0 separate tender, 19x26″ cylinders.
50 Ton Baldwin 6-wheel switcher, 0-6-0 separate tender, 17x24″ cylinders.

Complete Stock List on Request

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY
Birmingham Alabama

CONCRETE—CEMENT—EQUIPMENT

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225 bbl. Erie bulk cement plant, complete.
155 bbl. Fuller cement bin, electric batcher.
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Jaw: 6x12, 9x16, 10x20, 12x26, 13x30, 18x36, 24x36.
Gyratory: K.V.S. 19, 25-S, 30, 37-S, 49; Telsmith SA; Traylor 8″; Superior McCully 13″, 8″, 6″.
Jeffrey Type A 30″x24″ pulverizer.
Jeffrey 24″x24″ spiked roll crusher.
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Traylor apron feeder, 5′x15′.
Bucket elevator, 32′ chain, buckets 8″x6″x12″.
3′x6′ K.V.S. single deck, vibrating.
3′x6′ K.V.S. 3 decks, vibrating.
3′x6′ Telsmith, 2 decks, vibrating screens.
48″x20′ Allis-Chalmers revolving scalping screens, full manganese.
48″x20′ Universal revolving screen.

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Whirley, 25 tons cap., 85′ boom, electric.
Hayward Bucyrus-Erie Diesel 2 yd. shovel.
41-B Bucyrus-Erie comb. crane and shovel, steam.
P & H Model 650 crane, 60′ boom.
Northwest No. 4 crane and backhoe.
Lima Model 101 crane, 1¼ yd.
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Williams Hercules 1½ yd. digging clamshell. NEW.
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Barber-Greene conveyor, 24″x200′, complete.
8 Barber-Greene conveyors, 24″x35′, type N.
Brand new conveyor belt, special stock, 14″ to 48″. Head and tail pulleys, take-ups, rollers, idlers.

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120 HP gas engine, clutch, tex rope pulley.
Gas locomotives, 2½ to 35 tons.
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75 HP West. Slipring motor 220/3/60/850.
52 HP G.E. Slipring motor 440/3/60/570.
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Ingersoll-Rand Jackhammers	40.00 ea.
Chicago Pneumatic air drills, reversible type, 2" cap.	15.00 ea.
Chicago Pneumatic air drills, reversible type, 4" cap.	25.00 ea.
Chipping hammers	8.00 ea.
4" Reed's machinists' vises, swivel jaw, swivel base	6.90 ea.
No. 2 Whitney hand punches	3.00 ea.
2 ton Peerless chain falls with trolleys	39.50 ea.
2-VG William H. Keller Super Air Grinder (90% new)	20.00
75 ft. lattice steel derrick booms	100.00 ea.
Harris heavy duty cutting torches, gauges, tips and hose	37.50
Diesel marine clutch 2" shaft	20.00
⅝" Black & Decker electric drills ac	23.00 ea.
Brick carriers	65c ea.
600 Gallon underground gas tank with pump	20.00
Sasgen (Standard) full circle steel derricks	49.50 ea.
¾ yard Williams digging bucket 90% new.	250.00
1 yard Owen material handling bucket "J"	150.00
8" Type B Emerson steam pumps	90.00 ea.
No. 2 Toledo adjustable pipe threading device, threads 2½ to 4"	19.00
36" Genuine hickory sledge or pick handles	19c ea.
50 H.P. Upright boiler with fittings	275.00
25 steam boilers 8 to 60 h.p.	

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SELTED: 355, 528, 676, 1000, 1300 & 1570 Ft.
ELECTRIC: 478, 676, 807, 1302, 1722 & 2850 Ft.
DIESEL: 603, 807 & 1000 Ft.
PORTABLE GAS: 110, 160, 220, 310, 540 & 1300 Ft.
STEAM: 49, 310, 528, 1300 & 2200 Ft.

BUCKETS
50 Skips and Battleship Type, 2 to 6 yds.
5 Owen & Bucyrus Rock Grabs.
CLAMSHELL: ½, ¾, 1, 1½ & 2 Yds.
ORANGE PEEL: ¾, 1, 1½, 2 & 3 Yds.
DRAGLINE: ½, ¾, 1, 1½ & 2 Yds. Cap.

CRANES & DRAGLINES
5 Ton BROWNHOIST, 30 ft. Boom Gas.
12 Ton NORTHWEST 50 Ft. Boom Gas
12 Ton KOEHRING 45 Ft. Boom Gas
18 Ton Speedcrane, Gas, 50 ft. Boom
25 Ton BROWNING & 30 Ton AMERICAN Locomotive
25 Ton LINK BELT K-48 Electric, 70 Ft. Boom

CATERPILLAR SHOVELS
⅜ Yd. BYERS Electric & ⅜ Yd. Insley Gas
¾ Yd. KOEHRING Gasoline
¾ Yd. 1¼ Yd., 2 Yd., 4 Yd. & 8 Yd. MARION Electrics
1 Yd. NORTHWEST Gas & 7/8B2 Steamer
1½ Yd. BUCYRUS 41B Steamer

DUMP CARS
46—KOPPEL 1¼ Yd. 24 & 30 In. Ga., V Shaped
15—2 Yd., 3 Yd., 4 Yd. 36 In. Ga.
20—Std. Ga. 12 Yd., 16 Yd., 20 Yd. & 30 Yd. Cap.

BALL, ROD AND TUBE MILLS
6x8 Continuous Pebble Mill
5x5 Batch Mill
5′x22" HARDINGE CONICAL Dry Ball Mill
5′x36" HARDINGE CONICAL Wet Ball Mill
3′x8" HARDINGE CONICAL Dry Ball Mill
6′x22" HARDINGE CONICAL Pebble Mill
8′x22" HARDINGE CONICAL Ball or Pebble Mill
4x8, 8x8, & 10x9 Straight Ball Mills
4x18, 5x18, & 5x22 Tube Mills
3½x8 & 5x7 Air Swept Tube Mills
2x4½, 3x10 & 5x12 ROD MILLS

PULVERIZERS
JEFFERY 24x20 B & 21½ Sturtevant Ring Roll
RAYMOND Auto. Pulverizer No. 0000, 0 & 3
RAYMOND Imp Mills No. 4, 32 & 55
GRUENDLER XXB Mill & Jay Bee No. 3 & 4
RAYMOND 4 & 5 ROLL MILLS & 5 Ft. Chaser Mill

SEPARATORS AND COLLECTORS
14 ft., 8 ft. and 12 ft. Separators
Type 360 Sly 8x24, 8x52 and 16x42 Dust Collectors

ROLL CRUSHERS
36x60 Fairmount & 36x16 Allis Chalmers
24x12 Power & Mfg. Smooth Roll

JAW CRUSHERS
10x8, 13x7¼, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 20x11, 26x15, 30x15, 30x13, 36x30, 36x18, 36x14, 36x17, 36x9, 36x6, 38x18, 36x10, 36x24, 42x9, 48x36, 60x42, 84x66, 36x16, 9x36
12x26 Champion, Screen & Elevator

CONE & GYRATORY CRUSHERS
42 in. McCully Mammouth Gyratory
18 in., 24 in., 30 in., 36 in. and 48 in. Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory
4—Nos. 5, 3 & 6 Austin Gyratory
2—Traylor T-12 Bulldog Gyratory
8 in. Traylor T. Gyratory, Telsmith No. 9
17 Gates K—Nos. 3, 4, 5, 6, 7½, 8 & 9½
10 Inch Austin Model 105
10 & 13 Inch Superior McCullus
KENNEDY: Nos. 19, 25, 27, 30 & 49

HAMMER MILLS
Pennsylvania Trojan M-1.
4 Jeffreys: 24x18-A, 36x24-B, 42x36-E & 42x48-B.
Williams No. 1 Jumbo Jr., & No. 6 Universal.
Gruendler No. 6 K.
Dixie Mogul No. 5040.

HOISTING ENGINES
7 Gasoline 15, 40, 60 & 100 H.P.
17 Steam 7x10, 8¼x10 and 10x12
8 Electric 20, 35, 50, 60, 100 & 150 H.P.

DRILLS
4—SANDERSONS 14 & LOOMIS 44
7—Ingersoll-Rand Wagon Drills

STEEL BINS
72 Ton BLAW-KNOX 2 Compt.; also 250 ton
100 Ton BLAW-KNOX 2 Compt.

CEMENT BIN
400 BBl. Portable BUTLER Bulk Cement Bin with Fuller Full Automatic Electric Push Button Weigh Batcher

SYNCHRONOUS MOTOR GENERATORS
100 K.W. RIDGWAY 3/60/2200-250-275 volt, 1200 rpm.
150 K.W. GEN. ELEC. 3/60/2200-250-275 v., 1200 rpm.
200 K.W. RIDGWAY 3/60/2200-250-275 v., 900 rpm.

SLIP RING ELECTRIC MOTORS
52 H.P. GEN. ELEC. 3/60/220-440 v., 1200 rpm.
(3) 100 H.P. GEN. ELEC. 3/60/220-440 v., 900-1200 rpm.

RUBBER HOSE
Air: ¼ in. to 1½ in. Water: ¾ in. to 10 in.

CONVEYOR PARTS
BELT: 1000 Ft. 60 In., 700 Ft. 42 In., 600 Ft. 36 In., 800 Ft. 30 In., 1642 Ft. 24 In., 317 Ft. 20 In., 397 Ft. 18 In., 1000 Ft. 14 In. & 16 In.
IDLERS: 36 In., 30 In., 24 In., 20 In., 16 In.
Head & Tail—Pulleys—Takeup for all sizes
Steel Frames: 2,000 ft. 24 In., 30 In. & 36 In. Sections

ROTARY DRYERS AND KILNS
36 In. x 30 Ft., 3 Ft. x 30 Ft., 4 Ft. x 30 Ft., 34 In. x 30 Ft., 42 In. x 34 Ft., 5 Ft. x 30 Ft., 5 ft. x 150 Ft., 8 Ft. x 60 Ft., 6 Ft. x 60 Ft., 6 Ft. x 70 Ft., 70 In. x 40 Ft.

STEEL DERRICKS
GUY: 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom, 25 Ton 100 Ft. Boom, 75 Ton 135 Ft. Boom

LOCOMOTIVES
GASOLINE: 3 Ton, 5 Ton, 8 Ton, 12, 14 & 30 Ton
STEAM: 9 Ton, 20 Ton, 40 Ton, 60 Ton & 80 Ton.
ELECTRIC: 2 Ton, 5 Ton, 8 Ton, 17 Ton & 40 Ton

SCREENS
VIBRATING: 2x4, 3x6, 3x8, 3x8, 3x5, 4x5, 4x8, 4x10, 48x72. HUMMER, ROTEX, NIAGARA & ROBINS
REVOLVING: 3x12, 3x16, 3½x15, 3x24, 4x16, 4x20, 4x23, 4x24, 5x30, 5x30, 6x20

SAND WASHERS AND CLASSIFIERS
4 LINK-BELT A-60 In. Classifiers.
7 ALLEY Cone 4 Ft., 5 Ft., 6 Ft., 8 Ft. TELSMITH 13 Ft. by 2 Ft. 8 In. Screw Washer.

RAILROAD CARS
12—50 Ton Cap. Battleship Gondolas.
7—50 Ton Cap. Flat Cars.

SAUERMAN DRAG AND SLACKLINES
1— ¾ yd. Gas 1—1¼ yd. Electric
1—1 yd. Electric 3—2 yd., 3 yd. & 4 yd. Electric

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(Cable Address: "STANEQUIP" New York)
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Pennsylvania 6-3565 or 6-3566

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BULK CEMENT UNLOADER: Fuller Kinyon, portable, self-propelled, with built-in motor, 40 H.P.-A.C., complete.

BUCKETS: Blaw-Knox 2 yd. and 3 yd. capacity, Clam Shell; one Hayward 3 yd. capacity Orange Peel.

CARS: Six Clark 30 yd. capacity, standard gauge, all steel, 2-way air dump cars, apron type doors; Six Kopple 12 yd. all steel, standard gauge, hand dump cars; ten 50 ton, all steel, hopper bottom gondola cars.

BOILERS: 100 H.P. Farquhar, locomotive type, on skids, National Board, 125 lbs. pressure; also one 40 H.P. Locomotive type, 190 lbs. pressure.

COMPRESSORS: One Ingersoll-Rand 320 cu. ft. portable, gas, on steel wheels.

CRUSHER SPECIALS: Two 24 x 36; one 13 x 30 Jaw Crushers. One Kennedy 25 Reduction Crusher, with 50 H.P. vertical motor, V-belt drive. One Allis Chalmers 13"; and one 30" Superior McCully Gyratory Crusher.

CRUSHER ROLLS: Two 16 x 36; one 16 x 42; one 24 x 54.

BELT CONVEYOR: One 36" x 200′.

DIESEL ENGINE: One 450 H.P. Cooper-Bessemer, 4 cylinder, 4 cycle, solid injection, 225 R.P.M., with or without 300 K.W.-A.C. Generator, 2300 volt, complete with all auxiliary equipment.

DREDGE PUMPS: One Morris 6" with 75 H.P., A.C. 220 volt, variable speed motor; also one Morris 10" Belt Drive.

DRILL SHARPENER: Ingersoll-Rand size 50, with Dies and Dollies for hollow, round, and Hex steel.

DRYER: One Ruggles Cole Double shell, 8′6" x 86′.

HOIST: Sullivan double drum, 50 H.P. electric, for sluicing and drag scraper work; one National 3 drum with swinger attached, with or without 65 H.P. Buda motor.

LOCOMOTIVES: Gasoline, 14 ton Whitcomb, 36" gauge, also one 25 ton Vulcan. Standard gauge.

KILNS: Two 7′6" x 100′ and two 6′ x 100′.

MAGNETIC PULLEY: 24" Dia., 48" Belt.

PUMP: One Fairbanks-Morse centrifugal, direct connected to 40 H.P.-A.C. Motor, capacity 1200 G.P.M. at 96′ head.

PULVERIZERS: One Sturtevant No. 1 Ring Roll Mill. One Raymond Five Roller High Side Mill.

SCREENS: 3 x 6; and 3 x 8, double deck Vibrator V-belt drive; one 60" x 20′ revolving screen for scalping or scrubbing, with one section blind; also two 48" x 24′ sizing screens, with 7′ diameter outer jacket. One Link-Belt 3 x 5, single deck, heavy duty.

SLACKLINES: Sauerman, 75 H.P. electric, 90′ mast, ¾ yd. bucket cables, etc.

TRACKSHIFTER: One Nordberg Model N, 4 cylinder, Hercules Motor, complete with boom for loading and laying rail.

TRACK: 600 ft. of 24" gauge, portable track, with switches and fifteen 1 yd. capacity all steel cars.

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16—20 yd. Air Dump Cars, Magor, S.G.
4—20 yd. Air Dump Cars, Koppel, S.G.
36—5 yd. Hand Dump Cars, Western, 36" ga.
1—1000 G.P.M. Pump, 300′ hd., 100 H.P., 3/60/2200.
1—700 G.P.M. Pump, 200′ hd., 50 H.P., 3/60/2200.
1—10" AMSCO Manganese Pump.
1—Compressor, 750 C.F.M., I-R Imperial 10, Steam.
12—Hoist Motors, new, 50 H.P. and 25 H.P., 3/60/440.
1—Tube Mill, 5′x22′ Allis Chalmers.
1—25-ton Industrial Locomotive Crane, 50′ boom.
1—300 KVA Fairbanks Morse Diesel engine generator, 3/60/480.
1—170 KVA Fairbanks Morse Diesel engine generator, 3/60/460.
2—862 H.P. New Casey Hedges Longitudinal Tube Boilers, never used.
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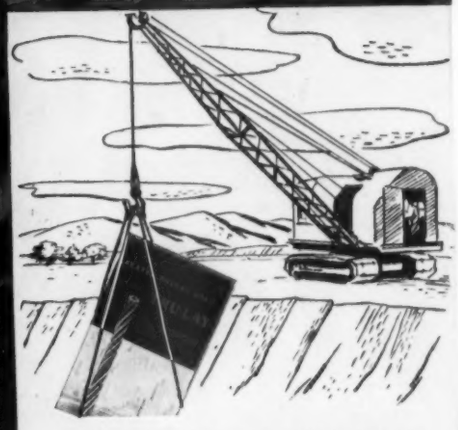

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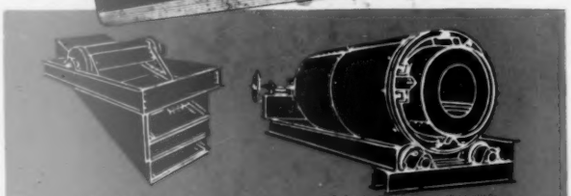
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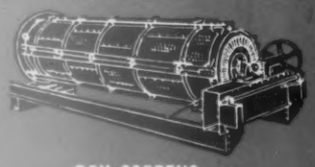
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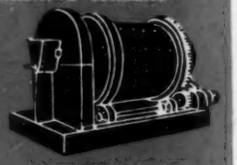
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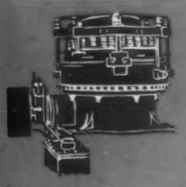
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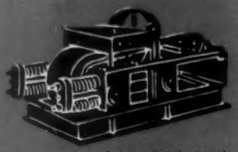
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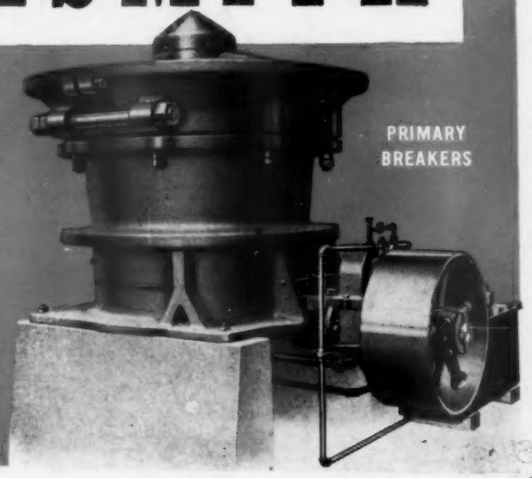
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